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[ILLUSTRATED.]

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Extravagant Claims for a New Illuminant.

A recent report of the exhibition at the Crystal Palace contains mention of a new illuminant, which, according to the inventor, is to supersede not only the electric light, but which is so brilliant and far-reaching as to make the arc light cast a shadow when brought in comparison. The new agent is called Lucigen, and is so powerful that at a distance of 150 paces from a jet which costs but three pence per hour, ordinary manuscript may be distinctly read.

The cheapness of the new illuminant is accounted for by the fact that the crude and waste oils from gas factories is the source from which it is manufactured, its costs, on the authority of a gas analyst at Glasgow, being about one-tenth that of common gas.

The light is produced by a mixture of compressed air and minutely divided particles of oil, which, together, form a vapor that, when ignited, gives a steady and continuous flame of great brightness. The flame is controlled by a tap in a similar manner to gas.

The new illuminant, it is claimed, can also be turned to a very practical use in conjunction with another discovery by the same inventor, which is styled the Pyrogen, an apparatus for the heating of metals, which will probably be of great use to engineers, as it acts with greater cleanliness, economy and certainty than would be the case were coal used. The heat can be easily regulated by turning a tap, and can be raised to whiteness in a few minutes, while it can, if desired, be kept absolutely steady for any required length of time.

Heating of Points by Electrostatic Discharge.

In a recent note on the heating of points by the electric discharge, M. Semmola thus describes some experiments he has made:

A point is used made half of antimony and half of bismuth, soldered at the extremity, so as to constitute a thermo-electric couple. Having connected the point with the prime conductor of an electric machine, the poles of the thermo-electric couple are connected by wires with an insulated galvanometer of low resistance.

When the plate of the machine is rotated, the needle of the galvanometer deviates because of the thermo-electric current produced by the heating of the point as it discharges the electricity of the conductor to which it is attached. It is scarcely necessary to remark that, with a mono-metallic point, no current is produced.

A current may even be obtained by attaching the point, not to the conductor, but to a large metallic bar in communication with the ground and at a short distance from the machine.

On performing these experiments in the dark it is observed that when a small star appears on the point, the deviation of the needle is much greater than when the "plume of light" appears there. This proves that the discharge of negative produces more heat than does the discharge of positive electricity. By bringing the point near the conductor, so as to have a constant spark, thin, hissing, and visible in daylight, the deviation of the needle decreases.

The electric blast of air that blows from the point is also hot, as can be easily proved by placing upon the conductor of the machine a curved mono-metallic point, a few centimeters distant from one of the faces of a Nobili's thermo-electric battery. On turning the plate of the machine, the electric blast blows against the battery, and the galvanometer needle at once deviates.

A point of bismuth and antimony, or one of iron and platinum, placed on a metallic bar in communication with the earth, and exposed upon the summit of an edifice, like a lightning-rod, might in certain cases be of use in examining the atmospheric electricity, and in detecting by the production of a current of feeble intensity the electricity of storms or of the aurora borealis.—*Revue Scientifique.*

FIG. 1.—CONANT ASTRONOMICAL CLOCK.

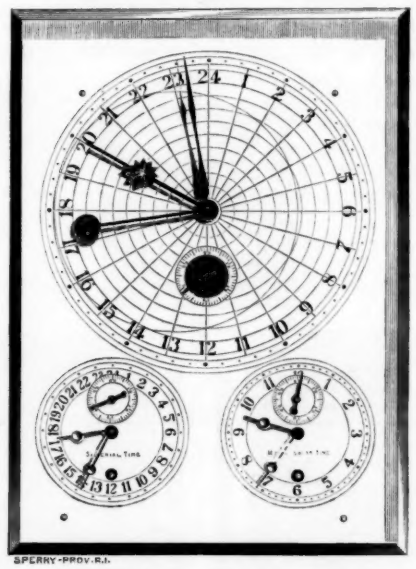

FIG. 2.—ENLARGED VIEW OF DIALS.

What is Contemplated in the Government Telegraph.

The following are the trunk lines contemplated in the Cullom postal telegraph bill: From Washington, D. C., to Portland, Me., *via* Baltimore, Wilmington, Philadelphia, Camden, Trenton, Newark, Jersey City, New York, Brooklyn, New Haven, Hartford, Providence and Boston; from Washington to Minneapolis, *via* Pittsburgh, Cleveland, Toledo, Chicago, Milwaukee, Madison, La Crosse and St. Paul; from New York city to Cleveland *via* Albany, Utica, Syracuse, Rochester, Buffalo, and Erie, Penn.; from Pittsburgh to Topeka, Kan., from Toledo to Detroit, from Washington to Galveston, from Chicago to New Orleans, from Chicago to St. Louis, from Chicago to San Francisco, and from Cheyenne to Denver. Postal telegraph offices are to be opened at the places named and at all intermediate points at which first, second or third-class post-offices are established. Branch lines shall be constructed from time to time as appropriations are made by Congress, the intention being to connect the telegraph with all cities where the postal free-delivery system prevails, but no additional facilities are to be provided in States already connected with the trunk lines until postal-telegraph telegraph offices have been established in every State and Territory. The system is to be constructed in straight lines as near as practicable, but regard is to be taken of cities that will afford the best telegraphic facilities to the public. The lines are to be constructed by the engineer corps of the army, and then transferred to the custody of the Postmaster-General. The poles are to be of iron, the wires of copper, and all other materials of the best character. Eight wires are to be strung on the line from New York to Chicago, and four upon other lines. The Secretary of War is authorized to use the millitary service lines of the United States as far as expedient, and also to make all necessary condemnations of lands or buildings at a fair compensation.

A Mariner Who Helped Lay the Old Atlantic Cable.

Capt. Stephen G. Sluyter died at Hartford, Conn., last week. He was engaged for several years in preliminary soundings for the Atlantic cable, and in command of the steamer Victoria laid the main cable in 1858. During the war he was in command of a gunboat, and at the time of the New York riots was anchored off Wall street to protect the United States sub-treasury. In early life he was associated in business in California with Stephen J. Field, afterward judge in the United States court, a brother of Cyrus W. Field. For the past 15 years Capt. Sluyter has lived in Hartford.

The Conant Patent Astronomical Clock.

It will greatly assist in understanding the relative workings of solar and sidereal time to describe a recently invented clock, which has shown itself to be fairly certain to perform its duty, as it has been in operation more than a year. It is a duplex, differential instrument; duplex because it is composed of two separate independent clock movements, each of which will run of itself, as it has a weight and pendulum of its own, whether its fellow is in motion or not. It is differential because the two movements are so connected to a third train, that a difference in their rates of speed induces motion in this third train which records said difference second by second as fast as any is established. To assist this description some engravings have been prepared:

Fig. 1 is a general view of the clock; Fig. 2 is an enlarged view of the dials; Fig. 3 shows the works with the dial plate removed, giving a view of the diagonal shafts that communicate the differential motion to the second hand of the upper train, and which are clearly shown in detail in Fig. 4.

The dials, Fig. 2, are three in number, and are furnished with hands for marking hours, minutes and seconds. The right hand lower dial is for marking solar time, and is divided into twelve hours only, as are the clocks ordinarily. The left hand lower dial is divided into twenty-four hours, and is to mark sidereal time. The upper and largest dial is divided also into twenty-four hours, and is to mark the mean right ascension of the sun in hours, minutes and seconds, and show his progress second by second throughout his yearly course, in the same manner as the solar clock shows his daily motion. The principal fixed stars in the northern sky, and as far south as the 20th degree in south declination are engraved as near their places given for the beginning of the year 1886 as possible, but not shown in the engraving (their motion being very slow), and their names are affixed. There is a supplementary hand to represent the moon in its mean R. A., as the hour hand represents the sun, the latter has a star-shaped decoration to distinguish it from the moon, which is round, and has some elements of a human face engraved upon it, and its motions are regular, and represent a mean or average moon. This dial shows at a glance the relative positions of all the heavenly bodies mentioned, and is really a map of the northern celestial hemisphere, the pole being at the center; the radiating lines mark hours in R. A., and are numbered 1 to 24. The concentric circles show lines in declination ten degrees apart. The large eccentric circle shows the apparent line of motion of the sun's center, and is to represent the ecliptic. This circle crosses the equator at the hour lines 24 and 12, locating the points of the vernal and autumnal equinoxes, and marks the summer and winter solstices on the hour lines 6 and 18. The hands on the large dial being actuated by the differential motion always show in hours, minutes and seconds, the absolute difference between solar and sidereal time and therefore the constant right ascension of the mean sun. The hand representing the moon is dependent on the same motion and bears the same relative position to the sun and

stars constantly as the mean or average moon does, and will pass the constellations substantially as the almanacs predict, and will approximately have the hourly position laid down for her in the American Nautical Almanac. She will also complete her cycle in the 19 years prescribed.

To make the action of the instrument more clear, we will suppose that the hands on each dial are all set at zero or exact noon. Now suppose we first start the sidereal clock; the seconds hand on the large dial responds to every tick of the sidereal movement, and moves at a rate exactly equal to it, so that at the end of an hour both dials mark the time of exactly one hour; this shows that there is one hour difference of time between the solar and sidereal clocks. Now suppose that the sidereal clock is stopped at the exact end of one hour, and the solar movement is started. The seconds hand on the R. A. dial reverses its motion and moves backward at the same rate of speed as the clock moves forward. And when the solar clock has accomplished a minute, the hands of R. A. dial have moved back a minute, showing that there is only 59 minutes difference in time; and when it has accomplished an hour, the sidereal and solar dials record one hour exactly each, and the R. A. dial is back to zero again, showing there is no difference between the solar and sidereal time. And no matter how long the two clocks run, unless one gains upon the other, the R. A. dial will not move its hands away from zero; but if it shows one second advance, then sidereal has gained one second over solar time, no matter how long or short the time elapsing in making that gain. Again, suppose they are running at their proper rate; when both clocks tick simultaneously the R. A. seconds hand makes no response beyond a slight shiver, but when one ticks before the other, the R. A. seconds hand moves forward a second responsive to sidereal, and immediately backward in response to the solar tick; so it will be seen that when more forward ticks have occurred than backward, the hand will show a second gained. Sidereal time gains one second in $365\frac{1}{4}$ solar seconds, or one in six minutes, and marks a gain of 3 minutes 56 seconds per day over the solar.

The mechanism of this instrument is very simple, and the Figs. 3 and 4 show it very clearly. The wheels *d* and *c* are fast to the escape wheel shafts of their respective clocks and are connected by the diagonal shafts *a* and *b* to the wheels *e* and *f*; the gears are proportioned so that the wheels *e* and *f* revolve twice while the wheels *d* and *c* revolve once; or once in a half a minute of time. It must be borne in mind that the wheels *e* and *f* are loose upon the shaft *h*, and also revolve in contrary directions, as is indicated by the small arrows; they are also furnished with two sets of teeth, being double beveled as shown. The shaft *h* is the shaft that carries the second hand of the large or R. A. dial, and is the prime mover of the train actuating the hands of the large dial, the first pinion being seen at the right hand end connecting into a large wheel. Between the double bevels *e* and *f* is a smaller bevel wheel *g*, which makes a connection between them, by means of which, motion is imparted to the shaft *h*; this gear, it will be seen, is loose upon a stud which is affixed to the shaft *h*, and acts to move said shaft whenever the said small bevel gear rolls around upon the face of either of the two double bevels. Its action can be best understood by supposing that we set the right hand clock in motion, leaving the other still. This will cause the wheel *c*, which is fast to the seconds shaft, to revolve once in sixty seconds; thence by means of shaft *b* motion is imparted to the double bevel *f*, which will revolve once in thirty seconds or twice in one minute. The other double bevel *e* being stationary, the wheel *g* will roll around between them and follow the wheel *f*, but at half the speed of it; this will cause the shaft *h* to revolve at the same speed as the wheel *c*, but in a contrary direction. Now stopping this clock and starting the left hand one will reverse the motion of the shaft *h* so that the seconds hand of sidereal and R. A. dials will revolve in the same direction and at the same speed. Now, without stopping this clock, suppose the right hand or solar clock be again started, the wheel *f* will move in the manner before stated, and if its speed is exactly the same as the wheel *e*, then the gear *g* will revolve idly between them without moving the shaft *h* in either direction. This being the case, the seconds hand of the upper dial, and of course the other hands, being dependent upon it for motion, will remain stationary; but if the left hand clock moves faster than the right hand one the gear *g* will move in the direction of the fastest motion by an amount equal exactly to the difference in speed of the wheels *c* and *d*. Hence the large dial records the exact difference in time between the solar and sidereal clocks, and therefore indicates always the right ascension of the mean sun. When therefore the sidereal time overtakes the solar time, there will for a second be no difference between them; at that instant the seconds and minute and hour hands on the large dial all point to zero or 24 o'clock R. A., which is the instant, astronomically, of the vernal equinox. The clocks now being in action, as the days pass, the solar clock marks 12 o'clock at mean noon, or when the mean sun's center is exactly on the local meridian, and the sidereal clock marks 24 o'clock the instant the point of the vernal equinox comes to the same meridian and the hands of the large dial show the position of the same sun. One complete revolution of these hands is the exact measure of our astronomical or tropical year.

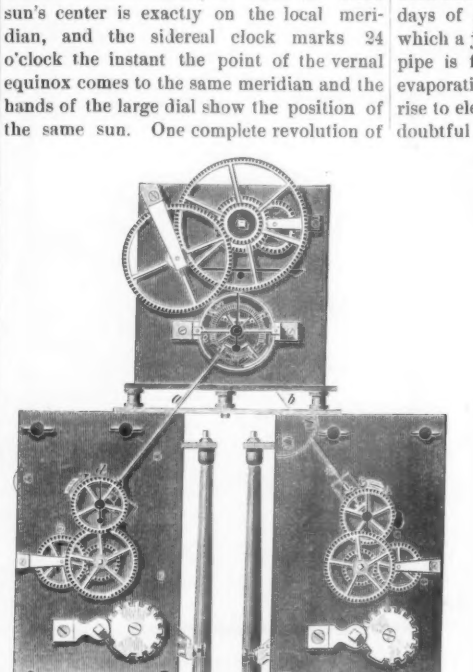

FIG. 3.—CONANT CLOCK WORKS—DIAL REMOVED.

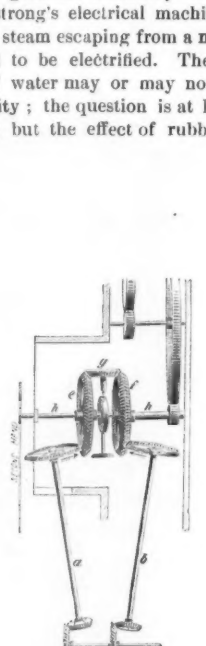

FIG. 4.—VIEW OF MOVEMENTS.

These movements being connected and interdependent as they are upon each other, makes the matter of regulating quite convenient. For instance, if solar time is right and right ascension wrong, then sidereal time is wrong and must be stopped or moved forward till R A. comes correct again. In a properly adjusted instrument, any two of the dials being correct, the third is necessarily correct also. It will thus be seen that a variation of even a second will be readily seen as recorded on the large dial.

Three of these clocks have been manufactured—one at Mr. Conant's residence; one at the Pawtucket Business Men's Association, and the other in the observatory of the Nichols Academy in Dudley, Mass.

Electrical Desiccating.

If sealing-wax, india-rubber, Canada balsam, or any sticky substance, be poured from a cup in a melted state upon the conductor of an electric machine, it will begin to throw out threads in an extraordinary manner.

When the resinous matter is very hot, the fibers are large; and sometimes they may be so small as to be almost invisible. Each fiber shoots out a cylinder with remarkable speed, then breaks into minute beads, which can be made to patter against a drum-head with the noise of falling rain.

The cup should be turned away from both operator and machine, or both will be covered with a wonderful sticky web. When a candle is held near, the filaments shoot into the flame, and sometimes cover the candle, though sometimes they return to the cup after approaching the flame, in consequence of discharging their electricity into the latter.

Miles of these sticky threads may be drawn out in a few minutes, and the breaking into beads offers a ready means of powdering substances not easily pulverized in ordinary ways.—*Ohio Valley Manufacturer.*

Lightning.

Thunder-storms are, as is well known, much more frequent in summer than in winter. Statistics recently collected in France show that during the three hot months of summer, lightning strokes, whether to animals, trees or buildings, are by far the most frequent; whilst during the winter months there are few or none. The cause of this is not very apparent; but a German writer has attempted to show, from observation and experiment, that electricity is generated by the friction of water vapor in the atmosphere; the vapor being raised up by the sun's heat. Friction of water particles has been known to generate electricity since the days of Armstrong's electrical machine, in which a jet of steam escaping from a narrow pipe is found to be electrified. The mere evaporation of water may or may not give rise to electricity; the question is at least a doubtful one; but the effect of rubbing of water particles against a mouthpiece is undoubted. There is also reason to believe that the particles striking against each other, or the atoms of the air, also give rise to electricity. The vapor thus charged condenses into floating masses which we term thunder-clouds.

Now, as a charge of electricity has the property of inducing another charge of electricity of an opposite kind to itself on any "conducting" matter near it, and as the earth is composed of what is called conducting matter, it follows that a charged cloud sailing over the surface of the earth induces an opposite charge on the ground below.

These two opposite charges, one of "positive," the other of "negative" electricity, tend, by another well-known property of electricity, to rush towards each other and combine. Hence, when they are able to overcome the resistance of the air between, which keeps them apart, they leap together with a flash and crack, producing the familiar phenomena of thunder and lightning.

It is the old story of the electric spark. When a rod of dry sealing-wax is rubbed with the warm hand or a silk handkerchief, it becomes electrified, and if it is then held near a piece of metal, a tiny spark accompanied by a faint snapping sound will be observed. In this experiment the sealing-wax corresponds to the cloud and the metal to the earth, and the spark which passes between them is the lightning.

Sometimes another cloud floating near the first one takes the place of the earth, and then the lightning flash takes place between them. Lightning of this kind does not strike the earth; but it might have a destructive effect on the latter for all that, because it might give rise to the "back-stroke," which is sometimes fatal to life.

The "back-stroke" is not due to the direct flash and discharge. It is rather the reaction after the direct discharge has taken place elsewhere. Suppose, for example, that a tract of upland country, a rural district with trees, farms, and here and there a church dotting it, is covered by a thunder-cloud, which induces a charge of electricity upon it. In order that the charge upon the earth may get nearer to that upon the cloud, so as to combine with it, the electricity, by another well-known property, will heap itself on the most prominent and pointed objects of the landscape. That is to say, it will accumulate on the trees, barns, chimney tops, and spires of the district.

The whole atmosphere of the region is in a state of tension and suspense. The bolt is trembling in the balance, but no man knows where it will fall. Presently there is a blinding flash of light, the sky is rent with a lurid stream of fire, and instantly the tension is relieved. The discharge has taken place at one point, the point which offers the path of least resistance through the air, and at which the electric tension was most critical. At every other place where the electricity had seriously accumulated, there is consequently a sudden fall of electric potential, or a collapse to its old condition, or, as it is called, a "return stroke." This instantaneous change is sometimes as fatal as the direct discharge, and it may ruin a building or destroy life several miles from the scene of the flash. The direct stroke is therefore more mysterious and unexpected than the flash, but fatal effects are comparatively rare from it. Nevertheless, since the latter have been attributed to this cause, a person cannot feel quite safe, although a thunder-storm with lightning is still several miles from him; the number of miles being estimated by counting the seconds which elapse between the flash and the peal, and allowing a distance of four miles for every second counted. He may feel safer than if it were close upon him, but there is still some room for fear.

In fact, there is no real safety except within the area properly protected by a lightning conductor, or in a building which is itself a protector, for instance, a sheet-iron house. Every building, then, should be protected in order to be safe. In the country, where these are often isolated, a lightning-rod would be required for each; but in towns one rod would sometimes protect more than one house around it, according to its height and conductivity. Lightning-rods, as they are now made of copper, are so expensive that most people prefer to trust their chances of escaping a discharge than have their homes protected. Yet a change of feeling in this respect will probably come about in course of time, especially if lightning-rods can be had, as they are likely to be, for a trifling sum. It is important, however, that the rod should be properly planted with a good "earth" connection, and properly run up above the chimney with pointed ends into the air. Although the rod may be a simple affair, for example, two or three twisted lengths of telegraph wire, it should only be applied to the building by a person skilled in the work, or else it may invite instead of warding off destruction.

Thus bare electric light and telegraph wires running on poles in the open air have sometimes been taken into buildings carelessly, and by providing a path of less resistance for the lightning to "earth," have brought the discharge down upon the roof of the building. The effect may be more forcibly realized by conceiving a person to carefully plant the bottom of his lightning-rod in connection with the earth and then take the other end indoors, instead of running it outside the house until it cleared the roof.

The flash takes place at the point of least resistance, because it is here that the two opposite electricities can easiest rush together. But the eagerness with which they tend to

rush together is another thing to be considered. These two things taken together determine the discharge. There may be less resistance to the flash at one house or tree than at another, but if the attraction between the opposite electricities is less at the former, the flash may traverse the latter house. Hence one cannot exactly say if one tree or building will be safer than another. There is great uncertainty, and this is a reason for the instinct of awe and uneasiness which most animals feel on the approach of a thunder-storm.

In general, however, we can say that high houses, or those perched on high ground, are more likely to suffer from the discharge than small, low-lying houses. The former are, therefore, all the more eligible for protection; and they are to be avoided in seeking shelter from a storm. So are houses surrounded by trees, and with ponds or pools of water close beside them. For trees act as imperfect lightning-rods, having a good earth connection, and, especially if they are wet, the discharge may strike the house in order to reach the ground through them, or, in the case of the pond, through the water. One should not shelter under trees of any kind, but more especially tall soft trees like poplars. Many deaths have been incurred from sheltering under poplar trees in France.

Thunder-storms are said to be more frequent in open, treeless countries, such as the Transvaal or the Scottish hills, and the fact has been attributed to the unchecked ascent of electrified vapors; but, on the other hand, they are probably less destructive in such countries. One fatal accident, a few years ago, may be remembered by many, that is, the death of Lord Lauderdale, who was killed by the discharge while out grouse shooting. The discharge entered his forehead, and after emerging at his breast left the marks of its passage in two streams down the left leg. The brain and spinal cord being of nervous matter are better conductors than other parts of the body, and hence are not disturbed to the same degree as the latter. The flesh is sometimes rendered livid, and at others quite charred. Curious pink prints, as of arteries and trees, are sometimes left on the skin by the fluid; and watches are fused, clothes singed, and boots torn into shreds or pierced through, as happened in the case of Lord Lauderdale. Often death is quite painless, since it occurs before the brain has time to feel; but at other times, as in the Lauderdale instance, it is accompanied by intense suffering. Those who are not killed outright and recover their senses, tell of feeling a heavy blow when the shock came, and the disintegrated and disordered system occasions them severe pain.

Chimneys, by creating currents of warm smoke, and by their lining of conducting soot, are dangerous parts of houses, and there are many instances of the discharge taking that road. It were better, then, to avoid sitting near a fire in a storm. Indeed, the safest place in the house on such an occasion would seem to be in the cellar and basement rooms, or upon an iron bedstead. In the open air, there cannot be a safer place than a dry hole or ditch, for it places the body below the surface of the ground, and therefore not exposed on a prominent place. But it should be a dry hollow, else the water in it may invite the discharge; for water being a conductor in good connection with the earth, lowers the resistance to the discharge.

Fire balls are the comedy of lightning and play the "antic" part. Many singular feats are recorded of them, such as quietly floating down a chimney, and after astonishing the inmates of the room, suddenly disappearing up the chimney with a flash and bang. They are frequently witnessed, and a flash of lightning was seen during the past summer from Westminster Bridge to throw out fire balls like Roman candles. Nevertheless, the true nature of fire balls is not at all well known. M. Planté has shown by experiment that they are perhaps the luminous end of a gentle discharge of current electricity passing between a charged cloud and the earth. Both observations and experiments are, however, still required to explain these mysterious vagaries.

Of late years new light has been shed upon the phenomena of thunder-storms; and there are signs of a more systematic study of their effects being instituted. Professor Schuster's recent discovery that air is, comparatively speaking, a conductor of electricity, provided it be "polarized" by the passage of another electric discharge, has an important bearing on this subject, and helps to explain the length of some lightning strokes. The experiments of Threlfal on the production of ozone by electric discharges in air, confirms the common belief that lightning freshens the atmosphere; and the results of experiments in depositing dust and vapors by statical discharges from a Wimshurst machine, also strengthen the popular faith in lightning as a purifier of the air. In fact, the "smuts" frequently observed when the atmosphere is dull and "thundery," may be a similar effect to what he has observed. Again, the experiments of Professor Hughes on self-induction lead to the conclusion that the best form of lightning-rod is a flat ribbon of copper, or a strand rope of copper or iron, since it has less self induction than a round rod or wire.

It has also become clear that in order to insure protection by lightning-rods they should be periodically tested by a competent person; and Messrs. Siemens and others now supply apparatus for this purpose, together with the separate insulated wire to the lightning-rod, which is necessary to complete the testing circuit. By this means the conductivity of the rod can be ascertained from time to time. Indeed, it is becoming more and more evident that lightning-rods should only be erected by skilled electricians knowing the business thoroughly, and there is some reason to think that the Board of Trade, or at least the insurance companies, should provide that lightning-rods be erected in conformity with the conditions laid down by the Lightning-Rod Committee, or, to speak more correctly, in accordance with the latest results of electrical science.

France has for some time past instituted observations on, and collected statistics of, lightning strokes. Germany has established observatories for studying the same phenomena, and at the recent meeting of the British Association at Manchester the Hon. R. Abercromby proposed a plan for the systematic study of thunder-storms. It will thus be seen that combined action is being brought to bear upon this important subject. Already the Germans have discovered that low marshy lands and inlets of the sea are more frequently visited by lightning than dry uplands. There is much, however, to be found out, and the subject, besides having a peculiar interest, is both profitable and humane.—*Industries.*

Forty-Seventh Competition—Applications of Electricity.

APPEAL TO PRODUCERS.

The special exhibitions of electricity which since 1881 have followed the Paris Exhibition, the general exhibitions in which, since the same time, electricity keeps a rank more and more important, the institution in several countries of electro-technical academies and of trial laboratories, the numerous publications which take the form of complete treatises, memorials, periodical reviews, and are consecrated to the theoric and practical study of electricity are not only a striking manifestation of the considerable development received by that study, but also some powerful means of action called to contribute largely to the progress of this branch of sciences and industry must be considered in it still, the valuable teachings that may be drawn from it, and which are used as basis in the seeking for new improvements are not always complete enough or sure enough or methodically enough arranged to allow a comparative appreciation of the apparatuses, arrangements or processes employed in the production or utilization of the electric energy; for some of them, the given conditions are altogether insufficient or are entirely missing, and the results of the isolated trials, given by those which have been subjected to a serious examination are not sufficient to establish their relative merit, because very often the objects answering a determined purpose have been experimented upon without a common plan and at different points of view.

The great competition of sciences and industry opening in Brussels in 1888, and in which we hope you will be willing to take part in offering to electricians a way of filling that gap; the comparative appreciation of the objects relating to each of the desiderata formulated by the committee is founded upon results of examination made according to common rules and according to a programme of which the articles shall be determined by an International Committee composed of the most competent specialists; and you may expect from their learned collaboration, and from the appeal made to the measuring instruments manufacturers another result not less important—that of endowing science and industry with a new element of progress by rendering the methods of trials more general, more complete, more exact and more practical.

E. ROUSSEAU,

Report of the British Association Committee on Electrical Standards.

The committee was appointed for the purpose of constructing and issuing practical standards for use in electrical measurements. The committee report that the work of testing resistance coils has been continued at the Cavendish Laboratory, and a table of the values found for ten various coils is given.

LEGAL OHMS.

No. of Coil	Resistance in legal ohms.	Temperature.
Elliott 183, C.C.L. 173	.99938	16°3
Elliott 184, C.C.L. 174	.99934	16°3
L. Clark and Muirhead 251, C.C.L. 175	10.0040	17°
Elliott 117, C.C.L. 63	.99976	15°9
Elliott 185, C.C.L. 176	.99962	15°8
Elliott 186, C.C.L. 177	.99959	15°8

B. A. UNITS.

No. of Coil.	Resistance in B.A.U.	Temperature.
Elliott 41, C.C.L. 55	1.00286	16°2
Elliott 56, C.C.L. 56	1.00039	16°
University Coll. coil. C.C.L. 63	.99983	16°2
Taylor's coil, C.C.L. 68	.99985	15°25
Taylor's coil, C.C.L. 69	10.00209	18°1
Price coil, C.C.L. 66	1.00289	19°2
Price coil, C.C.L. 67	1001.39	19°4
Warden 292, C.C.L. 70	9.99416	16°5

Of these, the coils Elliott, Nos. 41, 56 and 117, have been tested before, but owing to the green coloration mentioned in the last report, showing itself in the paraffin, the paraffin was removed and the coils refilled with ozokerite, which can be obtained more nearly free from traces of acid. This change in all cases produced an appreciable increase in resistance amounting in the case of Elliott 41 to about .0025. The coils C.C.L. 63, 68 and 69, are three of the original B.A. units. C.C.L. 70 is a coil sent over from the Johns Hopkins University for the purpose of connecting their value of the B.A. unit with that found at the Cavendish Laboratory. Shortly after the Birmingham meeting of the Association the secretary received a letter from the Board of Trade, enclosing a copy of the general bases of a convention proposed by the French Government for the consideration of the powers with the object of carrying out the resolution of the Paris Conference with regard to electrical standards. The convention stipulates that a legal character is to be given to (1) the legal ohm, (2) the ampere, (3) the volt, (4) the coulomb, (5) the microfarad. These questions had been considered by the committee at the Birmingham meeting, and the following series of resolutions, which the secretary was instructed to forward to the British Government, had been agreed to on the motion of Sir W. Thomson, seconded by Prof. W. G. Adams: (1) To adopt for a term of ten years the legal ohm of the Paris Congress as a legalized standard sufficiently near to the absolute ohm for commercial purposes; (2) that at the end of the ten years period the legal ohm should be defined to a closer approximation to the absolute ohm; (3) that the resolutions of the Paris Congress with respect to the ampere, the volt, the coulomb, and the farad be adopted; (4) that the resistance standards belonging to the Committee of the British Association on Electrical Standards now deposited at the Cavendish Laboratory at Cambridge, be accepted as the English legal standards, conformable to the adopted definition of the Paris Congress. In reply, therefore, to the letter of the Board of Trade, the secretary sent a copy of the above resolutions, with a statement of some reasons which had led to their adoption. During the year the original standards of the association have again been compared by the secretary. An account of this comparison and of the very complete one made in the years 1879-81 by Dr. Fleming, the details of which have not been published previously, is given in appendix. The general result of the comparison is to show that there is no evidence that any of the original coils have changed in value since the year 1876, when they were compared by Prof. Chrystal and Mr. Samuda.

The results of this comparison showed that with the exception of the coil G (No. 43 in (Mr. Hockin's report) no change had taken place in the relative value of the coils since Mr. Hockin's comparison in 1867. The coil G has certainly not changed since 1876, and it seems probable, for reasons given in the appendix, that the difference between its values of 1867 and 1876 was apparent, and not real. Thus, with the possible exception of this coil G of platinum silver wire, the relative values of the seven coils remain as they were twenty years ago.

At the last meeting of the committee it was resolved, on the motion of Mr. W. H. Preece, seconded by Sir William Thomson, to recommend the adoption of the watt as a unit of power. The watt is defined to be the work done per second by the ampere passing between two points between which the difference of potential is one volt. The committee were also of opinion that it is highly desirable to proceed with the construction of an air condenser as a standard of capacity, and for this purpose they desired to be reappointed with the addition of the name of Mr. Thomas Gray, and a grant of £100.

The American Electric Girl.

J. H. STEDMAN in the *Graphic.*

A maiden fair to see, I know,
Of loveliness the essence:
Him upon whom her arc-lights glow,
She turns to incandescence.

When first we met, a shock I got,
But held on, just to test her;
Alas! I'd left at home, forgot,
My "sole lightning-arrester."

The keenness of her brilliant mind
Makes her o'er others tower;
Who sparks this girl of mine will find
Two thousand candle power.

Her silken tresses rippling flow,
You ardently admire;
Her small coquetting dynamo
Is wound with "thirty" wire.

Soft as the sweet magneto-bell
Her influence on you switching,
Your watch don't know what time to tell—
Her volt is so bewitching.

Winds of despair and storms of doubt
May struggle to benight her;
Should Fates combine to put her out,
Joy comes with her re-lighter.

Two pretty feet on equal poles,
Nimble and quick denote her,
The envy of all rival souls;
Who else has such a motor?

When longing nearer joys to taste
I strive with brave insistence,
Why will you fix about your waist
Shunt magnets of resistance?

Ah, alternating-current girl,
No praises can be flattery:
Short circuit, dear, and cease to whirl,
Make me your storage battery.

And, dearest, should you rather not
Accept my offering votive,
Might I most humbly ask you Watt
Was your Electro-motive?

To several circuits hereabout
You are the Central Station;
Would I all others could cut-out,
You lovely installation.

Soft nestled in your armature,
Lulled by your soothing brushes,
Your commutator's drowsy hum
All earth's excitement hushes.

No more my carboned heart would roam
Sweet girl, these wishes grant me!
Reduce your current to *one* Ohm,
My isolated plant, be.

Were I Am-Pere and she Gramme-Ma.
With insulation rounded,
We'd charge some unfrequented star,
And live there till we grounded.

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We invite correspondence from Electricians, Inventors and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JANUARY 7, 1888.

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If you are not a member of the National Electric Light Association, now is a good time to join. Every company, even the smallest, should be a member, when at so small a cost so great benefits can be derived.

The executive committee of the National Electric Light Association meets in Baltimore this week, and will probably arrange the programme for the next meeting. Responses already received by the chairman of the committee indicate that the West will be represented, and the East can be counted on every time.

Time in his noiseless tread goes steadily onward, and almost before we can realize it 1887 has gone after the fleeting years into the shadows of the past, and 1888, the mystic symbol, is upon us, freighted with the untold electrical wonders of the future, which will quickly flash into the realizations of the present and as quickly fade into the memories of the past, as the twelve Roman sentinels of Time come forward, salute, and vanish into oblivion.

The telephone investigation in this State has already borne good fruit. It was not what the monopoly howlers had quite expected. The idea had become so general that it cost nothing to maintain telephone service, and that the "box on the wall" represented the chief part of the investment, that the great expense of multiple switchboards, cables, renewals, repairs and labor, proved a paralyzing surprise to some of the loud shouters against telephone monopoly.

Every electric light and power company in the United States should be a member of the National Electric Light Association. The dues are but $10 per annum, and the advantages to be gained by possessing a membership in this progressive organization are such as should commend it everywhere. The next meeting occurs in February, and we hope to see present not only the large number of old members, but a complete representation of the new companies that have been formed during the past year.

The proceedings of the ninth annual meeting of the National Telephone Exchange Association, held at Pittsburgh, September 26th and 27th, 1887, have just been issued in neat pamphlet form by Secretary C. H. Barney, and a copy sent to each member of the association. There is a great deal of most valuable information in these proceedings, and a careful reading of them will convince every telephone man of the advantage to be derived in continuing these annual gatherings. The next meeting will be held in New York, in the lecture room of the club house of the Electric Club.

It seems that "Santa Claus Electrique," in last week's REVIEW, popularly twanged an electrical lyre. (This is to be taken as read, not as heard). The same lyre gives for this week a few notes entitled "Swear Offs Electrique," introducing new faces, scenes and plots, as the theatrical advance agent would remark. We all know that

> "A little nonsense now and then
> Is relished by the best of men."

And there is a good deal of fun as well as hard work in electrical life, and the REVIEW, with its recognized reliability, will continue to record both.

THE ELECTRIC LIGHT CONVENTION.

The regular annual meeting of the National Electric Light Association is officially announced to be held at the Monongahela House, Pittsburgh, February 21, 22 and 23. The first session will commence at 11 o'clock A. M., Tuesday. Members of the association desiring rooms are requested to notify Mr. S. A. Duncan, chairman of the executive committee, care of the Allegheny County Electric Light Company, Pittsburgh.

We hope to see a large attendance at this meeting. There will not only be important matter for discussion, the annual election of officers, etc., but an interesting exhibit of long-distance electric lighting now in operation in the city of Pittsburgh.

"THE KING IS DEAD—LONG LIVE THE KING."

Time flies—a way Time has had for a few years back—and 1887 is now a memory of the past, while 1888 has come with her mystic combination of figures, an omen of good, we trust. The last such combination, 1777 opened up for this favored country an era the like of which the world has never seen. The next will not occur till 1999, and we cannot help expressing the belief that the period now beginning will even surpass in splendid achievements the cycle just past.

And in the last year of that cycle electric development has kept pace with the promise of its past. True there have not been any startling discoveries, but the tree has been well fostered by its devotees, and has put forth many new branches, while the trunk has added to its girth and strength, and the summit now soars high above the whole forest of scientific attainments.

Electric lighting has made great headway, not alone in this country, but everywhere else, and this is as true of the arc light as of the incandescent. Arc lights themselves have had considerable development, not so much in the perfection of their operation, because they were long ago carried to a high plane in that respect, but because the demand has sprung up for lights of lower candle power and less expenditure of energy. The result has been the perfecting of lamps consuming as low as 150 watts and giving as steady a light at 150 candles as the larger lamps which have been the standard. Such a system, with four lights per horse power finds many applications, where people think the big lights could not be afforded. Incandescent lighting by inductive transformers has grown to enormous proportions and has come to stay. The magnitude of this growth can be appreciated in the statement made by the Westinghouse Electric Company, that they have alone installed almost 100 central station plants with this system during the past year. The Edison Electric Light Company are now engaged in, and nearly done with, the installation of what will be the largest central station plant in the world, located near Madison square in this city, and will have a capacity of upwards of 100,000 lights of 16 c. p.

The electric transmission of power has settled down into one of the fixed and humdrum facts of every day life, and as a consequence electric motors are whirling around, grinding out their daily tasks in the most matter of fact way. Their applications are legion. Among these may be mentioned as of more than average importance the use of electric motors for pumping water out of mines, in which some very exhaustive tests made lately in England prove their superiority over any other means of pumping. A portable motor and pump also promises very effective work in pumping out the water in the frail coal boats and barges on the Ohio river and its coal-producing tributaries, and the same sort of a device might with great effect be used in cases of emergency on all sorts of river and ocean craft having a steam engine in their outfit.

The day of electric railways is upon us, and we prophesy a great development in this direction during the present year. Already many surface roads are in successful daily operation, and the number will steadily increase. Before the end of the year several of the surface roads in New York will be operated by one or other of the electric systems.

Storage batteries have made marked progress during the year, and are now being rapidly manufactured and introduced by several large companies. They are a powerful adjunct to the incandescent dynamo for both lighting and motor work, and in the latter use are being adopted by owners of arc-lighting plants also. They have proved a strong factor in the development of electric railways, perhaps more in England and the Continent than in this country.

Primary batteries have not been left behind in the march of improvements. Chief among the advances made in these has been the final evolution of the silver chloride battery into a thoroughly practical element in the every-day electric work of the world. Every now and again the news has been flashed forth that Mr. So-and-So had discovered a wonderful improvement in primary batteries, in which the cost of zinc was to be an insignificant factor, and the poor man could soon flood his little home, if he had any, with the benign rays furnished at so much per ray by the new anti-zinc-consuming-ridiculously-low-priced primary battery; but somehow the poor man never get his cheap light. We confess to having no faith whatever in the primary battery as a lighting source. It looks too much like the principle actuating a man who would to-day refuse the economies of a modern steam engine in fitting out his laboratory, and instead put in one of the time-honored tread-mills driven by a chronically tired mule.

In the field of telephony much quiet work has been done, the most significant of which has been the progress made in long-distance transmission, and in the development of special devices and circuits for that purpose.

In telegraphy, perhaps the most important advance has been the perfection of the induction system for railway service, which is now an accomplished fact and in daily use for handling and controlling the movement of trains. This invention has a vast field of usefulness before it, and we are certain that hundreds of the lives lost during the past year in railway accidents could have been saved if this system had been in use at the time.

Electric smelting in the production of aluminum and its bronzes has made very satisfactory and substantial headway during the year, and its advantages keenly enough appreciated in Europe to instigate the commencement of one or two of the necessary plants there which will shortly be in full operation.

Electro-smithing in the welding of metals has been nurtured into maturity, and Professor Thomson's success in this line has called a rival into existence in the shape of the Bernardo process which, however, is as yet in only an incipient stage of development. It may, however, mature into a practicable form of electro-smithy.

It may be a fitting close of this brief resumé of the year's electrical progress, or rather of its prominent features, to mention the Acheson Calelectric generator, which was patented last week, and which we illustrate in this issue. The inventor claims an efficiency of direct conversion greater than can be attained by the successive conversion of heat energy into steam, mechanical force and electric energy. No figures are yet given to show the truth of the assertions of the inventor; but if his statements are based on actual facts existing under normal conditions, then it is, as we said above, a fitting close of the year's crown of laurels.

ONE POINT SETTLED.

Whatever the report of the Assembly Telephone Committee in this State may be—and we have it on good authority, despite all rumors to the contrary, that they have not yet come to a conclusion in their own minds, and will not until they have completed their examination of the voluminous evidence before them—one point is settled. There is no general or widespread dissatisfaction with telephone rates as charged in the State of New York. The committee examined into the affairs of every company in the State of New York, and prior to such session gave notice in the newspapers of the time and place of their meeting, announced that it would be public, and asked any one who had complaints to make on any score to appear and make them. Barring Rochester, which is a place apart, New York city is the only place where there was any response worth noting. In this city ten or a dozen gentlemen, summoned by the Sergeant-at-Arms at the request of the Board of Trade and Transportation, appeared before the committee. The majority of them, though closely questioned, did not complain of the rates. What they wanted was a more perfect service, and if they could get that they cared very little about the price. They regarded the telephone as an absolute necessity in their business, so they said, and they showed no unwillingness to pay for it what it was worth to them as a means of saving time and labor and of expediting business.

This much, then, is fairly and fully settled.

Those who have calculated on general dissatisfaction as to rates to back them in their onslaught on the telephone companies of this State have reckoned without their host. And as it is in this State so it is all over the country. Considering the service which it renders, the time which it saves, the facilities which it affords for the dispatch of business, there is no servant of the public so cheap as the telephone at current rates.

OUR CHICAGO LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

"When the gray-haired year is tottering
Down the steep and smooth decline,
When old "Bush book's" sickle whistles,
Cutting human oak and vine,
Then the man of news goes groping
Through the lanes and alleys dark,
Plies his muck-rake for sensations,
Phantom grim and specter stark."

That's the way the world goes. When the days are long, says the newspaper man, there must be more reading; and, acting upon the advice of an old physician to a younger man, proceeds at once to "kill a priest, drive over a woman, or burn a meeting house," that sensation may result.

The general manager of the Chicago Telephone Company, Mr. C. N. Fay, will, before these lines are published, go out of the telephone business as such, and George L. Phillips will succeed him; Mr. B. E. Sunny, superintendent of the same company, will also leave the service, and Mr. Charles H. Wilson, from the Central Union, will succeed him.

Now, there never was a better opportunity for the papers to get even on the telephone matter than right now, on general principles, and the occasion has been made especially felicitous by reason of the fact that the Supreme Court decision, soon to be made public, will, in all reasonable probability, shelve several bushels of other telephone companies, and render the reams of these telephone stocks now lying in newspaper safes throughout the country, of about the same value as Confederate States money.

Building Commissioner Edbrooke has been making a thorough examination into the condition of the various places of amusement, and among other suggestions, will recommend the placing of fire-alarm boxes at all such localities, as a precautionary measure.

One of the most sudden cases of transformation from a telegraph to an electric light man occurred in a Western city a short time since. A superintendent of telegraph on a Western road was notified that he would be expected to take charge, as managing electrician, of an electric light plant just put in. So he studied up—temporarily went out of the telegraph and into the electric light business. The last that was heard of him he was using the plant for a ground wire to a telegraph line—but the plant hadn't started when the messenger left.

The forthcoming yearly report of inspection of electric light plants in Chicago will show the total of arc lights inspected during the year, 857; incandescent, 5,226. Previous inspections to January 1, 1887, 16,495.

There have been two cases of death from electric currents. On June 20, Chas. Moeller, while endeavoring to adjust a lamp on a live circuit, grounded the current through his body and died at once. It was raining heavily at the time. July 1st, A. C. Holland grounded a live line while putting a motor in circuit and was killed. Both parties were experts, and presumed upon their knowledge of and familiarity with electricity. No other accidents have occurred during the year, if we except three or four trifling cases of grounding, occasional scares, but no fire to amount to anything.

The river plant is growing, and will be all right in a few days. There are several circuits running, and if there is any faith to be put in appearances, we shall have the wedge entered in a few days which is eventually to open up the entire city to electric lights.

Chicago, December 31, 1887. C. C. H.

We see that the new glass door at the entrance of the Electric Club is attracting notice from the daily press. A *Sun* writer states that the numerous particles of glass of which the door is composed are held together by "red putty." The truth is, that the manufacturers—the Belcher Mosaic Glass Company—must thank electricity, that they are able to electro-copper-plate the metal casting between the pieces of glass, thereby securing the striking effect that has attracted the observing eyes of the press representatives.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The Boston common council held their last meeting of the year on Thursday. The committee on underground wires made the following report, which was referred to the next city government:

"It is not necessary for the committee at this time to detail the arguments in favor of the underground wire system, for the reason that, in the minds of the majority of the citizens, the question is no longer one of advisability, but has passed that stage, and is now more particularly a question as to the best methods to be adopted for an underground system. The fact is now admitted in all the large American cities that the wires must ultimately be placed underground. The principal obstacles to the system have been done away with, and the main objection of the companies has practically reduced itself now to one of expense only. The cost of establishing the present overhead wire system has been excessive, and this expense will be practically a loss to the companies when the system is abandoned and the wires are placed underground. While it is also true that the first cost of placing the wires underground will be large, the cost of repairs and maintenance will, according to the testimony of experts, be much less than is required in the present overhead system. As the result of their investigations, your committee are of the opinion that all surface wires should be removed and operated underground, and, judging from what has been seen in New York and Philadelphia, and the information obtained in Brooklyn and Washington, electric wires can be worked successfully in underground conduits, the only question being as to the kind of system to adopt. Undoubtedly the brick subway seen in Philadelphia is a complete success, and will commend itself immediately to the most superficial observer; but, owing to the conditions of our streets, we believe that the system is not so well adapted to this city as that in use in New York. Your committee believe it would be unwise to compel the electric wire companies operating in Boston to place their wires underground in separate conduits, and that the city must either construct a subway for the reception of all electrical conductors, or contract with some conduit company to construct underground conduits of sufficient capacity to receive all surface wires in operation."

The N. E. Wiring and Construction Co. have taken the contract for putting in the 600 and over, Edison lights, which are to illuminate J. W. Tufts & Co.'s workmen as they turn out those ornamental soda fountains for which the firm is noted. They are also fitting up two of the Boston and Savannah SS. Company's propellers with 127 lights.

Messrs. L. S. Watson & Co., manufacturers of hand cards and patent machine wire heddles, at Leicester, Mass., have introduced the Thomson Houston system in their factory.

The mechanical engineer of the American Electric Manufacturing Company, whose consolidation with a Boston company has been recently noted, began operations on the new factory, at New Haven, on Thursday. When completed the new factory will employ about 600 men, with ample room for 1,000.

The following candidates for membership will be balloted on at the meeting of the Electric Club this evening: L. E. Lanphear, W. W. Turner, T. W. Sprague, I. W. Coiburn, Winthrop Thayer, H. W. Hamlin, G. H. Grant and H. C. Spaulding.

The annual ball and reception of the Telegraphers' Mutual Aid and Literary Association will be held at Odd Fellows Hall, on February 3.

The committees and officers of the same of the Electric Club have been appointed as follows: Chairman of the executive committee, Frank Ridlon; secretary, W. I. Barker. House and entertainment committee, chairman, A. H. Chapman; secretary, George W. Davenport; H. B. Cram, Edward Blake, A. L. Rohrer, J. T. Moriarty, E. L. Caldwell. Membership committee, chairman, C. M. Ransom, S. E. Barton, G. W. Adams, F. E. Clark, J. R. Lovejoy. Committee for the revision of the constitution and by-laws, C. M. Ransom, H. B. Cram, A. H. Chapman, and the president and chairman executive committee, ex-officio. Committee to draft rules, C. M. Ransom, S. E. Barton, A. H. Chapman with the president, and chairman of the executive committee, as before.

The Jarvis Engineering Company furnished an Armington & Sims engine for the Newburyport, Mass., Electric Light Company.

It is announced that an electric railway location has been granted in Newton, one of Boston's handsomest suburbs. T. W. S.

Boston, January 2.

Electrical Distribution.

A very interestiug and instructive historical paper on the above subject was read last week before the Society of Arts at Boston, by Mr. Wm. Stanley jr., one of the electricians, on the staff of the Westinghouse Electric Co, and inventor of the Stanley incandescent lamp. After a brief synopsis of the history of electric development, the lecturer comes to 1876, and gives the honor of meeting the difficulties of series arc lighting to Charles F. Brush. Brush's work was the "Open Sesame" to the wonders of electric lighting, and inventions of development crowded thick and fast upon the world from that time to this. The lecturer then briefly compares the relative cost of distribution at high and low potential, and strikes into the advantages of distribution by induction transformers, and refers to the efforts of Gaulard & Gibbs, Elihu Thomson, Rankin Kennedy, Zipernowski and Deri, and himself towards making the system a practical means of distribution. After briefly describing the construction of the Westinghouse Co's Converters he gives the following figures.

Distance, 3,000 feet. No. Lamps, 10,000. Maximum per cent. of Loss, 5 per cent. Copper at 18 cents per pound.

200 Volt Edison "3 wire" System.		1,000 Volt Induction System.	
Conductors cost	$126,634 00	Conductors cost	$2,658 00
		Converters	30,000 00
		Total	$32,658 00

Distance, 300 feet. No. Lamps, 500. Loss, 2 per cent.

Edison "3 wire" System.		1,000 Volt Induction System.	
Cost of Mains	$156 00	Cost of Mains	$3 60
		Cost of Converters	1,500 00
		Total	$1,503 60

Edison "3 wire" 200 Volt System.				1,000 Volt Induction System.		
Per cent. of loss in Mains.	Distance.	Number of Lamps.	Cost of Mains.	Cost of Mains.	Cost of Converters.	Total.
2	1000	1000	$3,511 00	$84 00	$3,000 00	$3,084 00
5	1000	1000	1,347 00	33 00	3,000 00	3,033 00
2	1500	1000	7,910 00	197 00	3,000 00	3,197 00
5	1500	1000	3,156 00	78 00	3,000 00	3,078 00
2	2000	1000	13,952 00	330 00	3,000 00	3,330 00
5	2000	1000	5,675 00	141 00	3,000 00	3,141 00
2	4000	1000	56,282 00	1,407 00	3,000 00	4,407 00
5	4000	1000	22,512 00	562 00	3,000 00	3,562 00

"From this table we see that the present cost of converters, the two systems cost the same, with two per cent. loss at 1,000 feet distance, with five per cent. loss at a distance of 2,500 feet distribution; and at five per cent. loss, the three wire system is the most economical for shorter distances, while the induction system costs less for greater distances.

"The distribution of electrical energy by means of the high potentials and induction coils has almost annihilated the cost for the mains, while it has introduced the item of cost of converters. At present prices for converters and copper at twenty cents per pound, fifteen pounds of copper equal the cost of one lamp capacity in converters, and the purchaser has an equal option of using either the three wire or converter system when distributing current at a distance of 1,100 feet, with two per cent. loss; 1,500 feet with five per cent. loss, etc.

'This brief review of the special art under consideration is a new illustration of the law that Nature yields up her secrets only step by step, one step at a time, to a patient observation of her ways and a bold acceptance of her suggestions.

"We are gradually approaching a solution, it seems to me, of the old question what electricity is. So far we only see her ways, certain results from certain conditions of matter. We no longer think that electricity is magic or that it is a liquid or a fluid, or a material substance at all."

Lighting the Ocean.

Recent experiments have demonstrated that an incandescent electric light of 100 candle power, sunk twenty feet in the ocean, will illuminate the surface sufficiently to distinguish objects within a radius of 250 feet.—*Boston Budget.*

Lighting Cars by Electricity.

What may well be called the "burning question" of how to light railway cars lends interest to the following from the *Chronique Industrielle* of November 6. The passenger trains on the Stuttgart-Halle line are lighted by the Bernstein system of incandescent lights and Khotinsky accumulators. The accumulators are not connected with any electric source, although a dynamo is carried in the baggage-car. On account of this non-connection the lights are not subject to pulsations. The dynamo, during the run, charges a battery of accumulators, which can be used in case any of the batteries supplying the light in any car should lose its force or efficiency, in which case this extra battery could be immediately attached to it. Each car has two batteries of eight accumulators each, and each battery weighs 150 kilograms. The accumulators of each car are separate and entirely independent of the batteries in the other cars. The lamps are fixed to the car ceilings. Third-class cars have three-candle-power lamps. First and second class cars have from five to sixteen candle-power lamps.

Applause by Telephone.

Some of the members of the Friendly Club, Meriden, Conn., had a novel experience in the telephone office Thursday night. One of the number is an expert violinist, and he played the "Cackling Hen" in close proximity to the long-distance telephone. Pretty soon applause was received from Philadelphia, and six or seven places along the line. The tunes of a music box were then wafted over the wires from New York, and the entire party in the Meriden office were connected by separate wires, so that the airs could be distinguished quite plainly. It was a treat that was hugely enjoyed by the listeners.

Poor Gas in San Francisco.

President J. B. Crockett, of the San Francisco Gas Light Company, answers the complaints of poor gas as follows:

"The enriching material used by us is known as Australian shale, and is in the hands of one firm in San Francisco, who control the whole supply for the Pacific coast, and it can be purchased from them only. On April 16th last we contracted for an ample supply to carry us over until far into next year. According to our contract this should not have arrived later than November, under any conditions, but owing to the general derangement of the shipping business of this port, caused by the late wheat deal, and subsequently the knowledge that Australia will produce an immense crop of wheat this year, has rendered tonnage very scarce and hard to get—which you can readily see by the present state of the coal market.

"The firm with whom we contracted have failed to deliver the shale upon which we so much depended, and inform us that it will not arrive for another six weeks. We had taken every reasonable precaution to obtain our supply in ample season, but as we had but one firm to depend on, and they failed us at the most critical time, we are positively unable to do better. We therefore must beg the indulgence of the people for a few weeks longer. You can readily understand that this has caused us more anxiety and trouble than any one else."

Telephonic News

*** Telephones are taking the place of speaking tubes in a number of large buildings.

*** How many telephone "hellos" would it take, placed end to end, to reach around the world?

*** The Mutual Library Company, of Philadelphia, has issued its patrons' catalogue for 1888 in neat form, including a list of all the leading foreign and American publications.

*** Kansas City, Mo., is the only city of over 100,000 inhabitants in the world that depends entirely on the telephone for its fire alarms. The system in vogue at that city is very successful and effective.

*** The Wallace Telephone Company expects to furnish service in the city of Ottawa, Canada, this month. A telephone exchange, in which the rates promised are fascinatingly low, is to be started at once. What the service will amount to remains to be seen.

*** The United Electric Company, of Salt Lake City, Utah, remembered their friends with blotting calendars the first of the year, and, of course, the REVIEW office received a supply. Mr. C. F. Annett, the well known telephone man, is at the head of the company, with Mr. Chas. S. Smith secretary.

***The pleasant recognition of the loyal work of their employes, by the present to each of a turkey, was shown by Messrs. Baker & Co., the platinum men of Newark, N. J., on Christmas last. No labor troubles are apt to enter where the kindly feeling that prompts such generous action prevails on the part of employers.

*** It is estimated that the comparative cost of two 5,000-subscriber telephone exchanges (multiple switchboard) as against one of 10,000 subscribers, is in the proportion of about $38,000 for each of the former against $90,000 for the latter, making quite an item in favor of the smaller exchange as far as cost is concerned. In point of quick and reliable service, the one large exchange would, no doubt, make the best showing.

*** The interesting fact is stated that so indestructible by wear or decay is the African teakwood, that vessels built of it have lasted one hundred years, to be then only broken up because of their poor sailing qualities from faulty models. The wood, in fact, is one of the most remarkable known, on account of its very great weight, hardness and durability, its weight varying from forty-two to fifty-two pounds per cubic foot; it works easily, but on account of the large quantity of silex contained in it, the tools employed are quickly worn away. It also contains an oil which prevents spikes and other iron work with which it is in contact from rusting.

*** The demand for telephones in Great Britain has never equaled that of our own country. The following table shows the order of the popularity of the telephone. Aberdeen stands at the top, with a telephone to every 201 of the population, and London at the bottom, with one to every 1,185.

Town.	Telephone	Population.	1 telephone to every
Aberdeen	521	105,000	201
Perth	137	29,000	211
Inverness	76	17,500	218
Dundee	623	140,000	224
Glasgow	1,472	522,000	354
Liverpool	1,396	586,000	419
Manchester and Salford	1,293	588,000	457
Greenock	132	66,000	500
Blackburn	229	115,000	502
Belfast	439	221,000	502
Paisley	104	55,500	532
Nottingham, etc	293	190,000	644
Edinburgh and Leith	394	280,000	711
Leeds, York, etc	554	400,000	720
Birmingham, etc	520	500,000	961
London	4,200	5,000,000	1,185

Drawbaugh's "Electrical Paradox."

The sound-recording electrical machine of Daniel Drawbaugh is called an "electrical parodox" by the inventor. It consists of what Mr. Drawbaugh calls a microphone and a registering dial. The microphone, which is extremely sensitive, is placed in a hollow iron tube, which is hermetically sealed The microphone, when it is to be used on land, is attached to an iron screw with a very wide thread, by means of which it is sunk firmly into the earth. An insulated wire, which may be buried or run over tree tops, as the emergency may necessitate, connects with a galvanic battery and the registering dial, which may be placed miles away. The registering dial is surmounted by a needle that works from the zero point. Underneath the dial, in the small circular brass box that it covers, is another needle in the form of a walking beam, like those seen on side-wheel steamboats. When the vibrations of sound, either by the medium of earth, water or air waves, affect the sensitive microphone, the needle beneath the dial is at once caused to dip. The dipping puts one end of the steel into a diminutive pot of mercury, and a new local current of electricity is started, which moves the needle on the face of the dial and serves to give the alarm. The practical working of the instrument is intended to do away almost entirely with the picket lines of an army. To give an instance, a commanding officer may sit in his tent supplied with a registering dial and keep informed of the approach of a large body of troops from any direction, by a proper distribution of the stakes containing the hermetically sealed microphones, a dozen of which may be used, as the situation demands. The instant the air or earth vibrations caused by the tramp of feet or the sound of voices affect the microphone, that instant the effect is shown on the face of the dial by the turning of the needle from the zero point. The instant the sound ceases at the microphone, the needle flies back to the zero point again. The same local current that moves the needle can be made to ring a bell, or sound an alarm gong. For use at sea the arrangement is similar, except that the microphone will be inclosed in a hermetically sealed box of gutta percha or some other material that will withstand the action of the water.

It is Mr. Drawbaugh's intention to put into this box also a small hammer, which will strike a metal plate each time the microphone is affected. He argues that on a war vessel miles of wire may be carried. To one end the box containing the microphone and hammer is to be attached and cast adrift astern. The movement of any large body within this radius will be registered on the dial. The extent of the radius cannot as yet be accurately stated.

Telephonic Communication Between Lighthouses and the Shore.

This important subject engaged the attention of the Plymouth Chamber of Commerce on Friday, when Mr. Bayly pointed out the great importance it was to captains and others to know the state of the sea to the windward, as, for instance, in the case of a captain having his vessel at Dartmouth and being able to communicate as to the state of the weather at Eddystone or the Lizard. Again, communication by telephone would be eminently useful in case of an accident, when assistance could be at once summoned from different points. In the case of the *Soudan*, although the vessel ran aground within half a mile of the coastguard station, and within twenty miles of Plymouth, twelve hours elapsed before assistance could reach her. The result was that that fine steamer was now lying a wreck off Salcombe harbor. He considered that all lighthouses should be put into communication with the telegraphic system, and the different coastguard stations connected by telephone. The cost would be small. He moved a resolution to the effect that a memorial should be addressed to the Admiralty, the Board of Trade and Trinity House, urging that the coastguard stations should be put into telephonic communication with the telegraphic system of the country, and that communication should be established between lighthouses, lightships and the shore. A discussion ensued on the proposition, in the course of which Mr. Groser mentioned that last year he had an opportunity of having a conversation on that very point with the secretary to the Board of Trade, who was heartily in sympathy with the proposition. However, the difficulty was that there were four government departments concerned in the matter, and they could not be induced to see eye to eye. The difficulty with regard to the use of the telephone by coastguards appeared to be that the greater part of their time was spent in patrolling, and that it would be necessary to appoint someone to listen for the telephone. He did not think, however, that such an objection as that would have any great force, and he advised them to continue pegging away. When the *Schiller* was wrecked on Bishop's Rock, many scores if not hundreds of lives might have been saved had there been proper means of communication with the shore. He called the attention of the Post Office to the matter at the time, with the result that all seaside offices were put into night communication with central offices. Mr. Bellamy remarked that such nations as Denmark and Germany possessed splendid telephonic and telegraphic facilities along their coasts. A partial promise had been obtained from the Trinity Masters that telephonic communication should be established between Eddystone Lighthouse and the shore, but they were afterwards informed that it was feared that it would interfere with the work of the assistants. Eventually the resolution was unanimously carried.—*London Electrical Review.*

How Prof. Morse Convinced the Skeptics.

It was about the time of the Whig National Convention of May, 1844, when Prof. Morse completed his first telegraph line to Annapolis Junction, a point about half way between Washington and Baltimore. The convention was held in Baltimore. Here, at the suggestion of Mr. John W. Kirk (whom the Postmaster General had requested to look after the expenditure of the congressional appropriation to Morse), the inventor realized that a great opportunity had come to him. On the morning that the convention organized he was able, by dint of work by night as well as by day, to get connection through to Annapolis Junction from his little Washington machine shop. He had placed a bright young fellow at the Annapolis Junction end, with instructions to get information of what the convention had done just as soon as the afternoon Baltimore train arrived at the Junction, and telegraph it at once to Washington.

Of course the capital was in a ferment; every citizen was anxious for the news from Baltimore; but till trains should arrive from the scene it was recognized that nothing could be known.

The earnest old fellow spent that eventful afternoon all alone, save for the companionship of John Kirk. Anxious even to excitement, he had finally succeeded in getting a satisfying message from the Junction that all was right at that end of the line and ready for the transmission of the news as soon as the expected train should arrive. It was an experience to leave life-long impressions, and it isn't wonderful that Mr. Kirk still vividly recalls that strange, remote room, in its forlorn trappings of wire and pots and chemicals, set in its center with the old man, nervous, eager, veritably gasping, for the realization of his life's chief hope.

Suddenly there came an animated clicking. He who was most interested bent forward as if intent on fairly consuming the strip of paper that crept out from the register. There was almost agony in his face, as, snail-like, the paper halted and hesitated, spurted a little, stood still made false starts and then spurted more, till—the message completed—Morse rose erect, looked proudly about him, and said, as grandly as though he were distributing kingdoms:

"Mr. Kirk, the convention has adjourned. The train for Washington has just left Annapolis Junction. And the ticket"—he hesitated, holding finally proof of his victory beyond all disputing—"the ticket—the ticket is Clay and Frelinghuysen!"

"You are quizzing us," was the quick retort he heard when this was proclaimed outside. "It's easy enough for you to guess that Clay is at the head of the ticket, but Frelinghuysen—who the devil is Frelinghuysen?"

"I only know," was the dignified answer, "that it is telegraphed me so from Annapolis Junction, where my operator had the news five minutes ago from the train that is bound this way, bringing the delegates."

In those days the twenty miles from Annapolis Junction to Washington made up a trip of an hour and a quarter for the exceptionally fast trains, such as that which was bringing the Whig delegates to Washington. Long before the journey was over the newspapers—enterprising even in those days—had extras on the streets, and the newsboy was crying lustily the chronicle that Morse had caught flashing through twenty miles of air. A great crowd of people was at the station. The extras, with their cabalistic legend, "By Telegraph," had whetted public curiosity to keenest edge. Out of the jammed train came the delegates piling, each anxious to be foremost in sending abroad to friends the inspiriting news that fortune was with Harry of the West. And how dumfounded they were, finding in very type before them the story that they had believed exclusively their own. Certain they were that no railroad train had preceded their own. How but by a miracle could the news have gained such headway? "By telegraph," so they read in the headlines of the journals. "By telegraph!" That pestiferous Morse! They had seen the wires stretching along the track all the way from Annapolis Junction into Washington; they had seen it, and they had joked about it glibly. Phew! It was hard to realize. But—but—but what can a man do when he can't do anything? The doubters and the scoffers became enthusiastically dumb.

S. F. B. Morse had won. When next he appeared in public the people showered him with huzzas.

He was no longer a dreamer; he was a doer; and there were honors for him unstinted. Yet he bore all meekly, once in a while the calm of that strong face giving way to a radiance seen there but seldom in the later years.

A stranger, who had been seated close to the little company, attentive to this reminiscence, which was recently related in New York, arose as Mr. Kirk halted, offered his hand, and said: "This is a great big treat to me, sir, and I hope you'll pardon my intrusion. My name is Plumb—Col. Ralph Plumb they call me out home in Illinois, where they elect me to Congress. I just want to add one word to the story you've told. I know something of it myself. I was a delegate from Ohio to that Clay convention. I was on that first train to Washington. I remember the little shed at Annapolis Junction, where we stopped on our way. I saw the man there who was ticking away on a little brass machine; I saw him and I talked with him. I wanted to know what strange thing he was doing, and he answered that he was telegraphing to Morse in Washington about our convention, and he pointed toward the wires overhead running in Washington's direction—the first wire ever put up for telegraphing. In common with all the rest of the real wise ones of the day, I hailed the affair as a huge joke, till we landed in the Washington city station; sure enough, Morse had had the news an hour or more ahead of us, and the whole city was informed of the fact that we had put a dark horse on the ticket with our hero Clay. The evidence couldn't be upset, of course; the most prejudiced of us couldn't presume to suggest that Morse's work was guessing, for no man alive would have imagined that Frelinghuysen could be made the nominee for vice-president. Yes, I'm downright glad to have met you, Mr. Kirk; you make me feel young again with this tale you've told. Now, can't you come down to Washington before this winter is gone? I'd mightily like to buy you one dinner."

The Telegraph Question in Congress.

The telegraph question has been brought promptly to the attention of Congress. Senator Edmunds has reintroduced his postal telegraph bill, a resolution providing for the establishment of a special committee to inquire into the advisability and practicability of establishing and maintaining a postal telegraph system has been adopted, and Senator Cullom has brought forward a bill providing for the establishment of a government telegraph as a part of the postal system. Other measures looking either to government regulation or government ownership may be looked for. The bills thus far introduced proposing positive action look only to the creation of a government telegraph, while it is known that other methods of dealing with the question have considerable support.

Of the measures contemplating the creation of a government system Senator Cullom's bill may be regarded as a type. It provides for the construction of ten trunk lines, including lines from Washington to Portland, Me., from Washington to Minneapolis, from New York city to Cleveland, from Pittsburgh to Topeka, Kan., from Toledo to Detroit, from Washington to Galveston, from Chicago to New Orleans, from Chicago to St. Louis, from Chicago to San Francisco, and one from Cheyenne to Denver. For the construction of these lines the bill appropriates $4,000,000. It provides for postal telegraph offices at the cities through which these lines pass, and at all intermediate points at which first, second or third class post-offices are established. The construction of branch lines is provided for as appropriations are made by Congress, the intent being to connect the system with all cities where the postal free delivery prevails. The lines are to be constructed by the engineer corps of the army, and then transferred to the Postmaster-General. The bill provides for the condemnation of lands and buildings where necessary, at a compensation to be fixed by the Court of Claims. It fixes a rate of 10 cents for each twenty words and 5 cents for each additional ten words for distances under five hundred miles, and an additional rate of 5 cents for each two hundred and fifty miles over five hundred. The bill further creates the office of Director General of Telegraphs as a part of the Post-Office Department, and makes it the duty of the Postmaster-General to report to Congress after the passage of the act a plan for the complete organization of the postal telegraph system.

This act is of interest as showing how far a legislator who is familiar with the conditions of interstate communication, and who has not generally been regarded as a man of extreme views, is willing to go in legislating upon the question of the government's relation to the telegraph. It is hardly likely, however, that a bill of such scope will pass Congress at this session. Public opinion upon the question has not yet been developed or informed to such a point as to enable it to pass with intelligence upon the advisability of creating a government telegraph, and, considered as an experiment, the plan seems to be too extensive. The skill of our government in the arts of administration has hardly reached such a development as to make people generally view the transfer of this great business to the hands of the government with entire complacency.

As has been indicated, however, the creation of a government telegraph is not the only alternative proposed. Some of those who have given attention to the matter advocate the purchase of existing lines. Others propose the sending of a commission to Europe to investigate and report upon the systems existing in Europe, while still others suggest an amendment of the Interstate Commerce law, so as to place the telegraph lines under the jurisdiction of the Interstate Commission, giving that body the power to regulate rates, punish extortion and prevent discrimination. The merits of these various plans will doubtless be thoroughly ventilated in the discussions which will be had upon the subject in Congress. For the present it may not be out of place to remark that there could be little objection to the last-mentioned plan, except perhaps as regards the question of rates. As regards the proposition to purchase existing lines, on the other hand, that will probably commend itself to very few—certainly not at the inflated price at which the plant is valued by the present possessors.—*Bradstreet's.*

Who Sent the Dispatch?

A train dispatcher relates the following singular occurrence:

"I had gone to bed and to sleep before it came in. It was exactly 11.50, as shown by the clock, when I got a call on the instrument, and as I sprang out of bed I heard the operator at K——, a station eighteen miles below me, clicking off, 'For God's sake stop and side track No 9! There's a runaway engine coming up the line!' I got this by ear, you understand, and I gave him an 'O K' as soon as he was done. In three minutes I was out doors and had my 'Danger—Stop!' signal set for the first time in months, and as I started down the track with my lantern I could hear the rumble of No. 9 as she crossed the bridge three miles above. She was on time and booming right along, but it was clear, and the red light would stop her.

"I should have told you that there were two tracks in front of the station. One was the main track, of course, and the other a long siding, with a switch at either end. No. 9 had the right of way at night, and, instead of side-tracking her, I proposed to switch off the runaway. I went down over the ties as hard as I could run, and just as I reached the switch I heard No. 9 blow for my station. While I was unlocking the switch the engineer called for brakes and then I knew he had seen the light and would stop. I pulled the bar over, and then picked up my lantern and ran back, reaching the station just as the heavy freight was coming to a standstill My purpose was to run down and open the other switch, and thus let the runaway out on the main track again, to run until her steam went down, but I had scarcely moved a hundred feet when I heard her coming. It was then too late, and I stood on the platform to see her go past. She was truly a runaway. She had broken away from the accommodation train, which came no further up than G——, and was coming up with a full head of steam, and everything roaring. There was gross carelessness in bringing about this accident, but it was covered up and kept out of print. We could hear the runaway a mile off, and we could locate her as she came through the woods by the shower of sparks flying from her smoke-stack. On she came, and as she struck the switch it seemed as if she must go over. There was a clickety-clash and a bang, and she righted and whizzed past us like a fiery arrow.

"We knew what would happen at the other end of the siding. There was a field beyond, and when the runaway left the rails she tore up a hundred feet of track, made splinters of a score of ties, and plowed her way into the field for a quarter of a mile and blew up. Had she encountered No. 9 on the main track there must have been a terrible smash-up. At the speed she was going the runaway would have climbed right on top of the train. After the explosion I entered the station and called for K—— to give him the news, but he could not be raised. I could not get him until the usual hour next morning, and then I learned something that made my hair stand on end. He had not heard a word of the matter! He was not in his office when the accommodation passed, and he had heard nothing from G——, the station above where the engine broke away. I then called for the agent at G——, and it turned out that at 5 o'clock on the afternoon previous, he had met with an accident by which he had been made delirious all night. When they went for him to telegraph about the engine he was in bed, and being held there by nurses, and they did not even try to make him understand what had happened. As a matter of fact and record, no living hand clicked that message to me. Every man on the line was examined, but all denied it. I heard it and understood it, and acted upon it, and it came from K——. How do I explain it? I never could. I have had people tell me that it was mind telegraphing to mind, but you can take any theory you wish. I was called for in the usual way, understood fully what was being said, and hurried out to do what I have described. The matter has been a puzzle and a mystery for years, and I have no hopes of a solution."

Speculation in Metals.

The speculation in metals, which is now in progress, is one of the greatest ever known in the history of the metal trades. It is primarily engineered by a French syndicate who began operations last spring by purchasing in the London market, the center of the tin trade, all the available stock, and by buying up in spot and in futures more than the total estimated supply of tin in the world. Agents were also sent to the mines in the East Indies and in Australia to select and purchase various lots, and the supply in the American market was also bought up. This placed them in entire control of the available supplies of tin in the world, and they then began to force up prices, in which they have been remarkably successful.

This, it is believed, they will do unless a financial panic or a war compels them to sooner unload. This French syndicate, which is currently reported to have a capital of $50,000,000, next turned its attention to copper, and with a financial backing from the heavy copper mining interests in Spain, which have been suffering from the very low prices of copper, started in to boom that market. A very favorable opportunity was presented early in the fall by the fire in the main mine of the Calumet and Hecla, which acted as a starter on the market and caused prices to advance a little The fire died out and the prices drooped somewhat again, but the syndicate kept up its manipulation, and towards the middle of October began to develop its plans, purchasing copper and pushing up prices.

This started and encouraged outside speculation, and by November 1 the market was becoming excited and moving upward. Since then there have been heavy speculative transactions weekly and prices have steadily advanced. The fire in the Calumet and Hecla broke out afresh a few weeks since, and with greater violence and extent, threatening to render the main mine useless, and has furnished a most potential argument for a further advance in prices. The syndicate seized upon this advantage, and, aided by many outside speculators, again rushed the price up with large sales. Exaggerated reports of the great injury to the Calumet and Hecla mines and machinery, amounting to claims of its total destruction, have stimulated both trade and prices, and given a most favorable opportunity for a much greater advance than would otherwise have been realized. An excellent idea of the course of prices may be obtained from the following table:

PRICES OF LAKE COPPER.

Jan. 1	11¾ @ 12c.	July 1	10⅛c
Feb. 1	11¼c	Aug. 1	10¾c
Mar. 1	10¾ @ 11c	Sept. 1	10¾c
Apr. 1	10⅛c	Oct. 1	10⅛c
May 1	10¼c	Nov. 1	10⅝ @ 10⅝c
June 1	10c	Dec. 1	16c

The present price is 18 cents.

The speculation in copper is now in full swing and the question naturally arises as to how long it will last. One of the most important elements in sustaining it or in affording it a basis is the fire in the Calumet and Hecla. For years this company, with its immense production, has pursued the policy of checking speculation and preventing overproduction, by selling at figures which, while affording a fair margin to itself, were profitless to many other mines. The increased production has come from large mines, which, owing to the low prices, have been compelled to increase their output in order to get reasonable profits.

In order to keep the prices down to a point where the smaller and poorer mines would find it impossible to make a profit, and to thus prevent unhealthy stimulation of production, the Calumet and Hecla intended to increase its production next year, and its example would have been followed by the other large mines. Now the fire in the main mine has upset all plans and has practically removed the greatest bar to speculation and an unhealthy advance in prices. The actual situation at the Calumet and Hecla is not as bad as is generally supposed. Though the main mine is on fire and closed up, the company is still working its Black Hills property, which is entirely cut off, and is obtaining from this mine from 1,800,900 to 2,000,000 pounds per month against a production of 4,200,000 pounds per month when working all the mine.

The total production of Lake copper per month was about 6,500,000 pounds, from which, owing to the stoppage in the Calumet and Hecla, must be subtracted from 2,200,000 to 2,400,000 pounds per month, thus giving us a production of about 4,300,000 pounds or 4,100,000 pounds per month. But the country needs and consumes about 5,000,000 pounds of Lake copper per month Thus there is an actual shortage in copper at present, even though the whole country produces 13,000,000 pounds per month and exports 3,000,000 pounds per month in ingots and copper mattes.

TELEGRAPHIC

.... The sudden cold snap last week, and the accompanying wind, caused much disturbance among the telegraph and telephone wires.

... Here is entertainment in a transcript of the earnings of that original Washington telegraph office for the first week—in April, 1845—that it was open for regular business:

April 1, 2, 3 and 4	$ 01
April 5	12½
April 7	60
April 8	1 32
April 9	1 04
Total	$3 09½

.... Mr. Frank C. Mason, the popular Superintendent of Police Telegraph of Brooklyn, is just finishing his fourth year in that position, and to celebrate the ending of his second term, invited several other attaches of the department to dine at Morello's, Twenty-ninth street and Fifth avenue, New York. Besides Mr. Mason, who sat at the head of the table, there were present: Deputy Commissioner Francis L. Dallon, Operators Jas. Campbell, William Gear, James Keenan, Thomas Cornell, John Maloy, Linemen Augustine Manee and Peter Higgins and Clerk Alexander Guise. The menu was Morello's best and was relished as only faithful and industrious men can relish a dinner served during a brief period of absolute relaxation from laborious work.

.... When asked whether he was in favor of the postal telegraph scheme, Senator Sawyer is reported as saying that he would favor a bill which had been before the committee one and three years ago That was that the Postmaster-General advertise for proposals to do government telegraphing and all other business offered at a price not to exceed twenty cents for twenty words, including the address and signature, for 1,000 miles and under; twenty-five cents for distances between 1,000 and 1,250 miles, and not over fifty cents for twenty words for any greater distance in the United States, night messages at half prices, the government to furnish room in post-offices where wires run and other points it might designate, the company to furnish operators and the government to deliver the messages at free delivery cities for letter postage. If the government received no bids at the above prices, then the Postmaster-General would be instructed to advertise for proposals for the purchase of all lines in the country and report the bids to the next Congress. This plan, Senator Sawyer said, would be similar to that adopted by the government in the operation of the mail service.

.... A new mode of telegraphing was tried by the military authorities of Belgium. It is a combination of the electric and the optic telegraph. The optic station is made up of a balloon held at any height above ground. Inside of the boat floated by the balloon, or on the bottom of the boat, six electric lamps were attached, which were connected with an electric battery on the ground by means of wires running along the rope which held the balloon captive. On the ground there was a Morse telegraphic apparatus An experienced operator spelled a message, the characters of which are registered on a common Morse apparatus by shorter and longer strokes upon a running band of paper. The shorter or longer the line is on paper, the shorter or longer is the time corresponding to it during which the electric current is working. Instead of marking time on paper, the apparatus used at the experiments made at Antwerp keeps the six lamps attached to the balloon blazing in bright light Any man understanding the Morse alphabet is able to read the characters given by the successive flashes of the electric lamps. A number of messages were thus spelled and correctly read by posts at distances of several miles. The balloon was only some three hundred feet above ground.

ELECTRICAL AND SCIENTIFIC

A Plea for the Electric Motor.

This is an age of progress,
Why not keep up with the times?
Why let your neighbor surpass you
In getting the dollars and dimes?
Foot power seems somewhat cheaper,
But is it as cheap all around?
Do you think that you get the same outcome
From a worker with health broken down?

Do you think you would like the gas engine?
Unsteady and dirty to boot?
Or even a small water motor,
Or boiler with ashes and soot?
These things are old-fashioned and faulty,
You ought to keep up with the times;
We think we can make a suggestion
That will help with the dollars and dimes.

Put in an electric motor,
It is handy and steady and clean!
You can start it and stop at your pleasure,
Its convenience is easily seen.
The power we make at our station
And sell it to you by the year:
We have all the dirt and the bother
Of cinders and ashes up here.

The power is cleanly and steady
And cheap and convenient and true;
If you'd like us to give you some figures
The way is now open to you.

Cincinnati, Ohio, Dec. 15. 1887. IVANHOE.

* * The *Lock and Bell* is a new monthly publication devoted to the interests mentioned in its title. Mr. Wm. Byrnes is the editor and publisher, with offices at 37 Broadway. The locksmiths and bell-hangers will have in this journal an exponent of their interests that they should sustain. The first issues are interesting and creditable.

* * The Holyoke Electric Light Co., which started some three years ago with 16 lights is now running some 350 lights of the Schuyler system, and the people are crying for more. The thing most desired seems to be "more light" everywhere, and there is a great field still in store for electric light companies.

* * The Mount Morris Electric Light Company, of New York, which was one of the lucky ones in securing a contract for lighting a portion of the streets, has contracted with the new Schuyler Co., of Middletown, for a 200-light plant as a starter, and fully expects to put in a large number of additional lights at an early date.

* * Messrs. Armstrong, Knauer & Co., 822 Broadway, will publish in a few days a directory of the leading trades and industries of the United States for domestic and foreign buyers. The directory will be printed in English, German, French and Spanish, will be largely circulated in South America and on the Continent of Europe, and will undoubtedly be a valuable and comprehensive publication.

* * In the phonograph of Mr. R. M. Hunter the aid of electricity is secured. Mr. Hunter takes a trace on a sheet of specially prepared carbon paper, and the instrument repeats the words through a telephone receiver, by means which will readily suggest themselves to the electrician. It is thus inferior to the Edison apparatus in the loudness with which the tones are reproduced.

* * The Schuyler Electric Company, of Middletown, has been organized, and has purchased the entire property, plant and patents of the Schuyler Electric Manufacturing Co., of Hartford. It has also purchased a new factory in Middletown, Conn., comprising five large buildings, four being of brick and one of wood. The main building is four stories in height and admirably suited for the new business. There is already a Harris-Corliss 75 h. p. engine and boiler which is to be used for running the machinery. A 125-horse Russell engine, boiler, etc., is now being put in, to be used for testing. The new company has also purchased a large amount of machinery through Prentiss Tool & Supply Co., of New York, and is still to make further additions.

We bespeak for the new Schuyler Co. as successful a business as its predecessor had before its president joined the American colony in Canada.

SWEAR OFFS ELECTRIQUE.

THE GOOD RESOLUTIONS OF A FEW OF THE ELECTRICAL WORKERS.

G. W. STOCKLY: "I'll never take Gilbert out hunting with me again. He not only shot all the game, but drank up all the ginger ale."

GEN. E. S GREELEY: "The next soldiers' day at New Haven will get along without me as Grand Marshal, or I'll have to get at new pair of lungs."

CHAS. SELDEN: "If you ever catch me experimenting with a messenger call wire by touching it to my tongue to see if it carries any current, you may put me down for a mugwump. I can taste that messenger call yet."

NAT. W. PRATT: "You will never catch me bluffing a newspaper man again as long as I live."

W. D. SARGENT: "I will never ask the telephone association to adopt another wire gauge."

HENRY METZGER: "Patience has ceased to be a virtue, and the next writer who gets my name spelled wrong can expect the worst."

C N. FAY: "No more statistics for me; my gas meters can beat the world."

C. F. ANNETT: "You can't expect a man to 'swear off' out here."

H. W. POPE: "I will never again attempt to run a square shooting match at a clambake against my meretricious brother."

S. B. RICHARDS: "Enough of selling carbons. I'd rather be treasurer of an iron company at five thou."

C. R. TRUEX: "I will never, hardly ever—here! who threw that brick?—permit so much latitude in storage battery statements."

C. A. BENTON: "I will never tell another ——. Thanks. A little lemon in mine."

R. W. DEVONSHIRE: "Don't have to swear off, you say? That is very kind. Speaking of advertising, I think we should increase the size of our card in your paper."

JOHN YOUNG: "If the W. E. don't fill those electric light orders, I'll be darned if I don't take a vacation."

COL. R. C. CLOWRY: "I'll promise not to knock out another opposition telegraph company—until it starts."

GEO. M. MEYERS: "I'll promise not to start another telegraph company until the Pacific Mutual is 'knocked out.'"

COL. J. J. DICKEY: "The next time I come to New York I will keep shy of that man Dutton."

CHAS. DUSTIN: "I did say that Hartford would always be my home, but Middletown is a pretty good place after all."

T. S KING: "You will never catch me going in at the wrong hotel door again."

J. J. FOWLER: "Down South we don't have so much temptation. Will save my resolves until the telephone men meet in New York."

JAMES KEMPSTER: "No more Long Branch cottages for me."

CARBON COMBINATION HAWKS: "I will never monkey with the carbon buzz-saw again."

CHAS HEISLER: "I've sworn off on 'summer carbons.' There's nothing in it."

B. E. SUNNY: "Electric light wires are not so bad for telephone wires after all, come to think of it."

WALTER C. KERR: "Swearing off don't count on Electric Light Association presidential nomination."

DR. LEONARD WALDO: "It will be a cold day when I undertake to explain to an English brother the difference between a self-given title of electrical engineer and that of an electrician."

D. L. HUNGERFORD: "You will never catch me bluffing on what I'll do for the Electric Club again. No, sirree."

A. J. DECAMP: "Not another electric light bid from me. I have exhausted the supply."

L. M. FISHBACK: "I am never going to leave St. Louis again."

W. M. HABIRSHAW: "Experience is an excellent instructor, and I shall trust my own knowledge from now on."

PARKER W. PAGE: "Never again will I resign—glad it wasn't accepted."

G. G. WARD: "Them's my sentiments."

A. L. BOGART: "This thing of working 14 hours at my office I have decided to stop."

H. P. FROST: "Those who fancy wild Texas lands can have them. I prefer pastures nearer New Haven."

GEO. H. PRIDE: "With the finest office building—the Equitable—in the country, guess I'll swear off on any other electrical work."

JUDGE W. H. KELLEY: "Think I know when I have had enough underground conduit business."

GEO. L. WILEY: "Those who enjoy life among the Mexicans are differently constituted from your humble servant. No more for me."

M. E. BAIRD: "If you ever see me rub up against a dynamo again, you may put me down for an electrified imbecile."

A. W. MCLAUGHLIN: "Perfectly satisfied with my past electrical experience. Corner lots in Kansas City discount everything."

GEO. N. STONE: "1888 may come and go, but it will not see me show another telephone subscriber the "kickers" board—unless I know his line doesn't end there"

CHAS. A. TUCKER: "I might swear off on taking electric light contracts, but that is what I am here for."

H. H. EUSTIS: "Will never wear my neat-fitting hat on New York visits."

H. A. CLEVERLY: "I will not leave Philadelphia for one year."

T. CARPENTER SMITH: "Never again will I claim to compete in good looks and martial figure with Major Jim English. Yet many friends say I should win."

F. J. BOYNTON: "To have to celebrate my election as treasurer of the Boston Electric Club on New Years, in addition to the usual festivities, has caused me to decide to swear off on everything."

P. H. ALEXANDER: "Here too, as president."

W. J. JENKS: "If I could only convince my good friends of the press that I had never been an editor I might be able to swear off on writing for the newspapers."

E. T. LYNCH, JR.: "No more proposals from me; this is leap year."

L. STERINGER: "I can't continue to invent lamp sockets if Carty and Beggs and Jenks keep me up talking to them every night until 2 A.M."

F. G. STONE: "I'll swear off kind of generally, except on learning French in Boston"

H. A. REED: "When I am caught on the Piano Committee again it will be a cold day."

A. G. NEWTON: "I will swear off on everything except Eddy's improvement in electric motors"

HUGH J. TOLAND: "On letting Gilbert put up any more electric lamps."

CAPTAIN E L. ZALINSKI: "Now that I am a Captain, U. S. A., all my friends should swear off on calling me Lieutenant."

FELIX GOTTSCHALK: "The man that says the Electric Club's glass door is stuck together with red putty again, will swear off for the last time."

JAMES BROWN: "My firm resolve is not to test any more rheostats on the ocean cable."

ED. J. HALL, JR.: "I shall swear off on trying to keep secrets from newspaper men, particularly the REVIEW staff."

CHAS. J. KINTNER: "Never during this year will I refuse $15,000 cash for a half interest in a patent."

Acheson's Calelectric Generator.

It will be remembered that we made mention several weeks ago of a new invention by Mr. A. G. Acheson, of Pittsburgh, relating to the conversion of heat energy into electric energy. The patent has just been issued, under date of December 27. We present a view of this novel apparatus, and also publish the description and claims of the inventor:

Mr. Acheson says his invention is based, primarily, upon the discovery that if what is known to those skilled in the art as the "magnetic whirl" is produced in or about an electric conductor which is traversed by currents of heat an electric current will be generated in said conductor at each establishment and disestablishment of such magnetic whirl cutting said conductor. I have also discovered, continued the inventor in his patent, that such electric currents may be produced in such a conductor in a manner so that they may be utilized as power for all purposes for which electricity is applicable. In my experiments leading up to and in demonstrating and applying this discovery, I have used various means for producing these electric whirls in or about a conductor through which currents of heat were caused to pass, and without attempting to describe all the various ways in which this can be done I will refer to the accompanying drawing in describing one simple way which embodies the principle of my discovery of parts as therein shown, as many other arrangements will be apparent to those skilled in the art.

As a simple means for producing the magnetic whirls, I use a cylindrical core *A*, of some magnetic material, and wind the same with a series of convolutions, *B*, of insulated wire, the terminals of which are connected to some suitable generator, *C*, of electricity supplying an alternating, intermittent or vibratory current. Through this coil is passed the conductor or conductors *D*, forming the generating or converting coil, the terminals of which are connected to a working circuit, and means are provided for causing heat-currents to traverse said conductor—as, for instance, a gas burner, *G*. If, now, the electric current is closed through the convolutions *B*, a magnetic whirl is produced cutting the conductor *D*; and if at the same time heat currents are caused to flow through the portions of said conductor within the influence of said whirls, an electric current will be generated in said conductor at each establishment and disestablishment of the whirls, and a conversion of the heat currents or energy into electric currents or energy takes place in said conductor. I prefer to provide two magnetic whirls around the conductor with the direction of the lines of force in opposition; and by locating the source of heat between said whirls, so that the heat will flow from a central point in opposite directions, as shown in the drawing, the direction of the lines of force of the whirls with relation to the direction of the heat currents will be such as to produce or convert the said heat currents into electric currents of the same direction.

It will be understood that the cores *A* are not necessary, as the convolutions themselves will produce the whirl, and the electro-motive force of the converted current will depend upon the intensity of the magnetic whirls, the length of generating or converting conductor exposed to said whirls, and the volume and velocity of the heat currents.

The patent claims are as follows:

1. The method, substantially as herein set forth, of converting heat energy into electrical energy, which consists in causing heat currents to traverse an electric conductor and producing a magnetic whirl cutting said heat currents.

2. The method, substantially as herein set forth, of converting heat energy into electrical energy, which consists in causing heat currents to traverse an electric conductor and establishing and disestablishing magnetic whirls cutting said heat currents.

3. The combination, with an electric conductor and a heat generator for producing heat currents therein, of another electric conductor through which varying electric currents are passed, arranged in relation to each other so that the heat conductor shall be within the influence of the magnetic whirl of the electric conductor, substantially as described.

4. The combination, with an electric conductor and a heat generator for producing heat-currents therein, of an electric conductor through which varying electric currents are passed, arranged to produce magnetic whirls cutting the heat conductor, one on each side of the heat generator, substantially as described.

5. The combination, with an electric conductor and a heat-generator for producing heat currents therein, of a core surrounding said conductor on each side of the heat generator, and an electric conductor through which varying electric currents are passed, orming convolutions around each of said ores, substantially as described.

Electric Car-Lighting in Wurtemberg.

The Wurtemberg government has in practical use on some of its railroads the following system of electric car lighting.

The lights in each car are supplied from separate accumulators which are charged by a dynamo driven from the car axle. Each car is thus entirely independent, and if the train is stopped or the cars uncoupled the lights are not interfered with. The management of the apparatus is said to be very simple.

—— Athol, Mass , is calling for an electric light plant.

—— The electric light company at Decatur, Ill., is increasing its plant.

—— An electric light system is to be established at Cottonwood Falls, Kans.

—— The Seward Electric Light and Power Co , of Seward, Neb., has a capital stock of $10,000 ; John Cattle, C. W. Barkley, and others, incorporators.

—— The Amsterdam, N.Y., Arc Light Co. has been incorporated ; capital stock, $15,000; J. Enders Voorhees, James Voorhees, and others, incorporators.

—— One of the most convenient and accurate tables we have seen for estimating the cost of copper, and allowing for the present rise in price of that very necessary commodity, is the one prepared by Mr. Wm. Habirshaw, the general-manager of the India-Rubber and Gutta-Percha Insulating Company, of New York.

—— The London *Electrician* says: "We have been interested to learn that Colonel Gouraud, who is a personal friend of Edison's, will in a few weeks enter into regular phonographic correspondence with him. The arrival in this country of Edison's first phonograph will naturally be looked for with considerable interest."

—— An electric arc lamp has been patented in Canada by W. S. Hill, of Boston, Mass. In this lamp, clockwork for feeding and adjusting the carbons is dispensed with, and a device used which depends upon the resistance in the circuit. The device used is also claimed to produce a very steady action and prevent flickering and unsteadiness of the light. An automatic cut-out is also provided.

—— Messrs. Whitney & Wilson, proprietors of the famous "Shawmut Mill," at Rochester, N. Y., have had their Sawyer-Man electric light plant in steady operation from the middle of last March. The plant cost them less than $800, and they have not yet laid out another dollar on it, nor renewed a single one of the 73 lamps in use. These gentlemen state that to light their mill with gas would have cost not less than $25 per month, or more than $200, since the date above mentioned, and still have been less satisfactory in every way.

—— The Crosby Electric Hose Signal Company has organized at Portland, Me., with a capital stock of $500,000 ; nothing paid in; par value of shares, $25. The stockholders are Edward H. Crosby, Eli M. Robbins and Thomas A. Swords, all of Boston, Mass. Edward H. Crosby, is president, Eli M. Robbins, treasurer, and the above named stockholders as directors. The purposes of the corporation are to carry on the business of manufacturing, selling, using, and leasing electric hose couplings, batteries, wires, and other electric goods.

—— Charles A. Schieren & Co. report sales of leather link belting during the past week to the following parties, for use on dynamos: Edison Electric Light Co., Philadelphia, Pa., 37 feet, 12″ Standard link belt ; Edison Electric Light and Power Co., La Crosse, Wis., 16 feet, 3″ Standard link belt ; Clark Electric Co., 43 Duane street, New York City, 24 feet, 6″ Standard link belt ; 31 feet, 3″ Standard link belt ; Plainfield Electric Light Co., Plainfield, N. J., 46 feet, 14″ Standard link belt ; Valley Worsted Mills, Providence, R. I., 48 feet, 12″ Standard link belt ; M. D. Moore's Sons, Lowville, N. Y., 39 feet, 7″ Standard link belt ; Sanford Light and Motor Co., Sanford, Me., 37 feet, 8″ Standard link belt.

—— The Brush Electric Light Company, of Chattanooga, Tenn., has made a number of improvements, and is now pleasing all patrons.

—— The Gas and Electric Light Company of York, Neb., has been incorporated. Capital stock, $8,000. D. E. Sedgwick, M. Sovereign and others are incorporators.

—— The Napa Electric Light Co., of Napa City, Cal., has been incorporated ; capital stock, $50,000 ; Joseph O. Hirschfelder, George L. Henzel, and others, incorporators.

—— W. N. Gray has been appointed a commissioner of the Centennial Exposition to be held in Cincinnati, Ohio, this year. He will have the planning and supervision of the lighting of the buildings, which will be very extensive.

—— This time the gas blew itself out. It was over in Jersey City, and in a gas office at that. It blew the office all to pieces, and killed a boy in the street ; but the gas office clerks came up smiling and kept on making out exorbitant bills. It is almost impossible to knock out the regular gas man.

—— There is at Detroit a conflict of opinion among lawyers as to whether the proceeding of the common council confirming the lighting contract entered into between the Controller and the Brush Company will go before the Mayor for approval. City Attorney Sheeran says it undoubtedly will, and the Mayor has power to veto it if he sees fit.

—— The Silvey Electric Company expect to have their factory at Lima, Ohio, ready early next month.

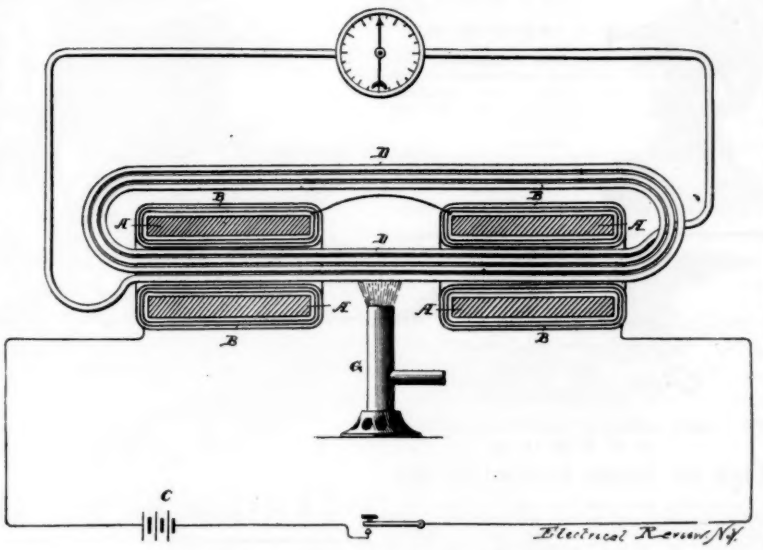
—— The residents of Holland, Mich., have requested the officials to do away with gas and substitute the electric light.

—— Sycamore, Ill., is calling for electric lights. The electric light agent that gets there first will probably get the contract.

—— The Board of Trustees of the Insane Asylum Home, at Jamestown, Dak., has contracted with the Edison Electric Light Company, of New York, for a 220 light plant.

—— Orangeville, Province of Quebec, asks for bids for 15 arc lights for city lighting, February 1st is the time for proposals to be in, and A. A. Hughson, town clerk, is the man to address.

—— The Iron Springs Hotel Company at Manitou Springs, Colorado, claim to have the best electric light plant in the State. It consist, of 150 Edison incandescent and 15 Fort Wayne-Jenney arc lamps to light up the hotel, cottages and grounds. The plant is situated at the foot of Pike's Peak, and is run by the snow water which descends from that popular mountain by way of Ruxton's Creek. A ten-inch improved mining wheel of the Leffel make does the work, with 100 feet fall. This plant was started July 1, 1885, and repairs do not average $10.00 per year.



View of Acheson's Calelectric Generator.

—— The Sioux City Light, Heat and Power Company (Iowa) has been incorporated. Capital stock, $100,000. Emerson McMillan, and others, incorporators.

—— Electricity is to be utilized at the Paradise Valley mine, Winnemucca, Nev., for lighting the workings and pumping water The dynamo will be run by water power six and a half miles distant, and the current will be conveyed through wires placed on the existing telegraph poles. A motor to raise water 420 feet will be placed in the workings.

—— A new gas company, with a capital of $50,000 has been organized in Baltimore. As gas has been as low as 50 cents a thousand in that city, there must be a profit somewhere to induce new companies to enter the field. The incorporators of the new company are: Geo. W. Lynch and David Z. Evans, of Philadelphia, and James R Hunter, James Hutchinson and William Sinclair, of Maryland.

—— The "Shaw" locomotive, for the temporary running of the street lighting portion of the electric light plant until the ruins can be rebuilt, is being placed in position at West Chester, Pa., and it is expected to work very well. The company, at a meeting held last week, elected Thomas Brinton to the position of superintendent, which vacancy was incurred by the killing of Superintendent Embree at the time of the explosion.

—— Messers. Holmes, Booth & Haydens have recently issued a number of neat card samples of their No. 6 B. & S. patent weather-proof electric light line wire.

—— Long Branch, N. J., is considering the adoption of the electric light in place of gas. An offer is made to furnish arc lights at 50 cents per night by a representative of the Thomson-Houston system.

—— Bids for lighting Philadelphia with electric lights were opened last week. The proposals show that the average cost for each lamp next year will be about 4½ cents less than for 1887. The total cost for 1887 was $102,000; for 1888 it will be about $93,780. The average cost per lamp will be about 50 cents per night.

—— The Rutland, Vt., electric light company is increasing its plant 400 incandescent and 30 arc lights. The company has received propositions from two manufacturing concerns that desire to use the idle day power; and in that case one dynamo will be run constantly, so that lights may be used at any hour of the day or night.

—— The plan of the city of Philadelphia, to manufacture its own electric light, is now being discussed. The municipal government now controls the gas-works and supplies water. Why should the same system not be pursued with the electric light, is the debatable question. There are now 524 electric lights used by the city. During the coming year there will be about 125 new lamps placed in position.

ELECTRIC LIGHT NEWS

—— At Brockport, N. Y., an electric light plant will soon be established.

—— The village officials of Ionia, Mich., think of substituting electric lights for gas.

—— The question of establishing an electric light system is being agitated at Chetopa, Kan.

—— The mayor of Brenham, Tex., is desirous of getting some points on electric lighting.

—— Geo. R. Conner, Commissioner of City Works, Brooklyn, N. Y., is asking for bids for street lighting.

—— The Fremont (Ohio) Electric Light Company started up last week. A number of store-rooms are lighted.

—— An electric light company is being formed at Hagerstown, Md., for the purpose of lighting the public streets.

—— In thirteen Southern States there were erected 98 electric light plants during the year just coming to a close.

—— There is a good deal of agitation over the electric light bids for city lighting in Philadelphia. A large number of bids were received.

—— The Union Paper Company, Holyoke, Mass., has contracted with Loomis Company to place the incandescent light in their mills.

—— The Portsmouth Electric Light Company, Portsmouth, N. H., have ordered a 100 horse power Armington & Sims Co. engine. This is the second order received from them.

—— The new Schuyler Electric Co., of Middletown, is rapidly getting itself into line in the way of getting its share of the business. The Mission Ridge Land Co., of Chattanooga, has purchased a 50-light plant, with which to light the new settlement at East Lake. The fine display made at the Piedmont Exposition at Atlanta, and which took the first prize and special diploma, was instrumental in making the sale.

—— Four dynamos of the Western Electric Company's system are used in generating light for the Chicago river. Their total capacity is 125 arc lights, and 100 will be used by the city. There are about ten miles of insulated cable laid inside of the docks and in the river, running to viaducts and bridges. These cover all the bridges from Polk on the South to Indiana on the North Branch, and to the mouth of the river. There are four of these lights on every bridge, two at every street end, and the viaducts are all lighted, every lamp being of 2,000 candle power. These will actually displace over 400 gas lamps, and will be run at a cost far below that paid for gas.

—— The Philadelphia Commissioners for the erection of the public buildings are at present wrestling with the important question of City Hall lighting. The President of the Commission, Architect McArthen, the Superintendent of Buildings and Chief Walker, of the Electrical Bureau, have been appointed a committee to ascertain the probable cost of illuminating the Hall with incandescent lights. It is the purpose of the Commission to secure the best system that can be introduced into the buildings, and that is the reason the Commissioners have refrained from receiving estimates and figures from the electric light companies. The task before the committee is an arduous one, involving not only the question of a plant, but the employment of capable men. It will require from 12,000 to 13,0 0 lights to properly illuminate the City Hall. The power for this large service is to be located in the court-yard, and it is necessary that the plant should all be constructed before the building is plastered.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DEC. 27, 1887.

375,328 Commutator or electric circuit breaker; Chauncey D. Baker, Chicago, Ill.

375,339 System of synchronism for telegraphy; Gilbert A. Cassagnes, Paris, France.

375,346 Electrically-propelled vehicle; Stephen D. Field, Yonkers, N. Y.

375,350 Portable electric coal mining machine; John B. Sneathen and Albert Michaels, Pittsburgh, and Moses A. Michaels, Allegheny, Pa.

375,392 Electric meter; William A. Stern, Allegheny City, Pa.

375,403 Automatic rheostat and contact point; Addison G. Waterhouse, Hartford, Ct., assignor to the Waterhouse Electric and Manufacturing Company, same place.

375,404 Calelectric generator; Edward G. Acheson, Pittsburgh, Pa.

375,414 System of electric gas lighting; William H. Doering, Philadelphia, Pa.

375,442 Hotel signal; Henry B. Cox, Cincinnati, Ohio.

375,456 Telephone; Edward C. Newton, Little Rock, Ark.

375,542 Electrical converter, motor and generator; Rudolf Eickemeyer, Yonkers, N. Y.

375,543 Electric circuit-changing and signaling apparatus. 375,544 Electro-magnetic arresting and releasing mechanism; Isaac H. Farnham, Malden, assignor to the American Bell Telephone Company Boston, Mass.

375,559 Galvanic battery. 375,560 Electric motor. 375,561 Primary electric battery; James F. McLaughlin. Philadelphia, Pa.

375,569 Automatic cut-out for fire alarm box controllers; Charles D. Rogers, Providence, R. I.

375,614 Sparker coil for gas lighting; Rudolf Eickemeyer, Yonkers. N. Y.

375,617 Electric call box; Leroy B. Firman, Chicago, Ill.

375,633 Underground electric conductor; De Witt C. James, Warren, Pa.

375,636 Fire extinguisher and alarm; Charles E. Kells. jr., New Orleans, La.

375,676 Electric motor; Edmond Julien, Brussels, Belgium, assignor to the Julien Electric Company, New York, N. Y.

375,685 Double spring loop key and circuit for multiple switchboards; Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place.

375,697 Tension device for winding electro-magnets; James W. Easton, New York, N. Y.

375,702 Flexible standard and conductor for electric lights; Ernest C. Fasoldt, Albany, N. Y., assignor of one-half to Oscar M. Meyrowitz, same place.

William Marshall.
Manufacturer of ELECTRICAL CONDENSERS.
STANDARDS A SPECIALTY.
Rooms 2 and 4 University Building.
Corner Waverley and University Places, New York.

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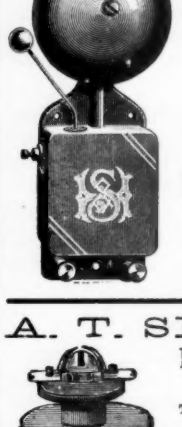

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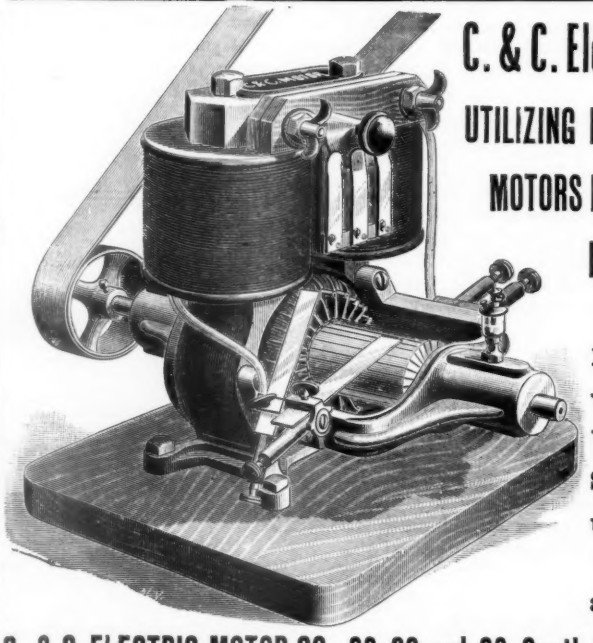

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